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ANALYSIS OF
SOME OF THE ANTHRACITES AND IRON ORES
FOUND ON THE
HEAD WATERS OF BEAVER CREEK,

IN THE COUNTIES OF LUZERNE, NORTHAMPTON AND SCHUYLKILL, PA

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In the course of some examinations in the summer of 1838, of the coal field lying partly in the county of Luzerne, and partly in Northampton and Schuylkill, I was, among other objects of interest, led to observe the explorations then in progress on the lands belonging to the Summit Coal Company and others, lying on the head waters of Beaver Creek, adjoining the property of the Beaver Meadow Coal Company.

As the facts presented by those explorations appeared to afford solutions of certain questions relative to the position of the coal beds in that neighbourhood, I was induced to make a collection of such of the minerals as appeared important in that view, as well as indicative of the value of the coal for economical purposes.

I should premise that the lands of the Summit Coal Company are situated mainly on a swell or bluff of land, lying between Pismire mountain on the north, and Spring mountain on the south, forming near its eastern extremity a tapering ridge or "*point hill*," between the north and south forks of Beaver creek; and at its western termination constituting a kind of table land, nearly as high as the tops of the two mountains above mentioned.

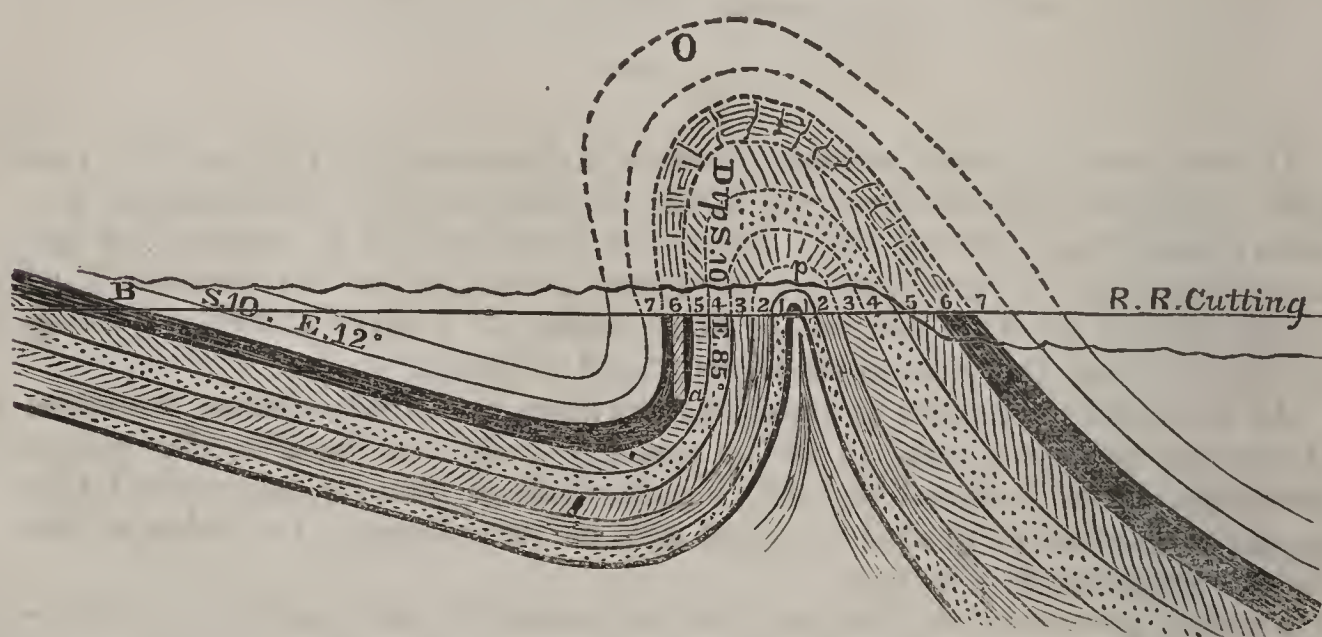
The circumstance in the character of the formation just referred to, is the general conformity of position in the coal beds in this part of the coal field with the prevailing figure of the surface of the ground. This is indicated first by the southerly dip of the beds on the south slope of Pismire hill and north of Beaver creek;—secondly, by the northern inclination of them where exposed on the north slope of the summit bluff;—thirdly, by the horizontal position found to prevail on the summit of the bluff; and

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finally; by the southern dip exhibited on the south slope of that bluff, to which may be added the northerly inclination of the strata in Spring mountain on its northern side.

The following sketch illustrates the view above given, and as it is derived from actual inspection and measurement of the coal strata, where they are exposed to view in a cutting formerly made for the railroad leading to the mines of the Beaver Meadow Coal Company, affords direct proof of the existence of more than one flexure in the Beaver Meadow coal trough. In this cutting there is displayed a nearly vertical bed of coal more than thirty feet in thickness; having, however, a real position or dip S. 10, E. 85°, and consequently a course or "strike" N. 80° E. In sinking a shaft in this vertical vein to a depth of 60 or 70 feet, it was ascertained that the inclination was changed to a northern dip; and the southern inclination at the surface of the ground was observed to continue southerly for one or two hundred yards, to a point where a thin seam of coal is seen to be cut through just at the level where it comes to an upward flexure, and after passing to the south of that flexure, the whole series of rocks recurs in an inverse order from that which had been observed in approaching it. The dip also changes at this point from 85° to a much lower southerly inclination.

The doubling of the strata together is thus indicated, and the flexure of the large vein now worked, as exhibited from B to *a*, is rendered highly probable. The faintly marked portion of the figure between O and *p* represents the supposed portion of the upward flexure which has been carried away by denudation.



Coal.—1. The *first* specimen of the coal was taken from the opening not far from the State road, on the summit of the bluff or central ridge, on which the lands of the summit company are mainly situated. It is compact and shining; the black colour slightly inclining here and there to blue-black; the surfaces of deposition nearly obliterated, and the cleats or slines which generally part coal vertically, scarcely, if at all, perceptible. Hence the direction of the fracture appears indifferent, taking place in various ways promiscuously, with a form mostly conchoidal. Slight traces of iridescence are occasionally seen, indicating the presence of minute portions of protosulphuret of iron.

Its specific gravity is	1.613
It contains of water,	3.43 per cent.
Gaseous matter volatile at bright red heat,	4.08
Carbon not volatile by simple heat,	87.48
Earthy matter,	5.01
	<hr/> 100.00

The ashes are of a fawn colour, of medium density, and contain the following ingredients in 100 parts, viz:—

Silica,	54.50 per cent.
Alumina,	34.45
Peroxide of Iron,	7.50
Lime,	2.25
Magnesia,	1.30
	<hr/> 100.

Having been taken from near the outcrop of the bed, this specimen is to be regarded as a rather less favourable sample than would be probably found under a greater depth of covering.

2. The next specimen analyzed was from the northerly slope of the bluff, also near the State road. In many of its external characters it resembles the preceding, but is less prone to give conchoidal fractures, and its specific gravity is 1.594.

It contains of water,	3.26 per cent.
Other matter volatile at red heat	1.05
Carbon,	91.69
Earthy matter,	4.00
	<hr/> 100.00

The ashes of this specimen were likewise analyzed, and gave the following result, viz:

Silica,	50.25
Alumina,	38.90
Peroxide of iron,	8.75
Magnesia,	1.25
Lime,	0.85
	<hr/> 100.

3. The third variety of this coal which was subjected to analysis, came from an opening which was in progress at the period of my visit to the Beaver Meadow. It was taken from a shaft then sunk fifteen feet in a bed composed partly of black dirt and partly of solid coal. The sample was taken from the solid part near the bottom. It is like the foregoing in regard to the obliteration of its surfaces of deposition, has rather less of the bluish tinge in its colour, possesses a specific gravity of 1.630, and will consequently weigh $2750\frac{1}{4}$ lbs. per cubic yard, or nearly $1\frac{1}{4}$ ton.

It contains of volatile matter,	9.6	per cent.
Carbon not volatilizable by simple heat,	85.337	"
Earthy matter,	5.063	"
	<hr/>	
	100.	

The ashes of this coal are likewise reddish-gray, varying but little in complexion from the preceding. The combustible *gas* given out in the distillation of this coal is of considerable amount, and indicates it as a fuel well adapted for use under steam boilers.

4. The *fourth* variety tried was taken from a pit on the north side of Beaver creek, and appears to be the third coal bed in the formation, reckoning from below, upwards. The inclination of this bed is to the south, and it accordingly dips under the bed of the creek. It is ten feet or more in thickness, and presents highly favourable indications as to facility in working. Its colour in fresh fractures is jet-black, shining. The form of fracture irregular, splintery; a striated appearance being occasionally observable.

Its specific gravity is 1.560. A cubic foot of it therefore weighs $97\frac{1}{2}$ lbs. and a cubic yard $2632\frac{1}{2}$, or about $1\frac{1}{6}$ ton. Of this coal two analyses were made. By the first, I obtained of volatile matter, including

Water and combustible gases,	6.89	per cent.
Carbon, not volatile by simple heat,	91.64	
Earthy residuum,	1.47	
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	100.00	

The ashes are of a brownish-red colour, tolerably heavy, and have all the appearance of being derived from a regular *red-ash* coal.

The unusually small proportion of the earthy residuum given by the above trial, having induced me to suspect that some error might have occurred and escaped notice, I repeated the trial with the utmost attention, taking care to determine, separately, the water and gaseous combustible matter. From this repetition, I obtained,

Volatile matter, 6.42 per cent.	Water,	2.19	per cent.
	Gas, (carbonic oxide, carburetted hydrogen, and a little tar,)	4.23	
Unvolatilizable carbon,		92.30	
Earthy residuum,		1.28	
		<hr/>	
		100.	

From this it appears that the first trial on this sample was not certainly below the truth in regard to earthy matter.

The diversity between the two experiments is not so great as will often occur in trying specimens from the same coal bed. Either may be regarded as highly favourable to the character of the coal. I may be allowed further to remark, that of all the trials of anthracites of which I have any knowledge, either by my own experiments or those of others, the analysis just detailed, gave the least proportion of earthy matter, and even of bituminous and cannel coals, I have met with but one result among the many on record, which was even so low in the amount of its earthy impurities;

and yet I have no reason to believe that the sample which I picked up at random at the mouth of the pit, was of better quality than the average of the mass from which it was taken.

If the four varieties of coal be viewed together, ranged in the order of their specific gravities, beginning with the lowest, we have the following table of results:—

	Sp. gr.	Vol. mat.	Carbon.	Ashes.
1st. (No. 4.)	1.560	6.42	92.30	1.28
2d. (No. 2.)	1.594	4.31	91.69	4.00
3d. (No. 1.)	1.613	7.51	87.48	5.01
4th. (No. 3.)	1.630	9.60	85.337	5.063
Mean . . .	1.599	6.96	89.452	3.838

From the above table, it will be perceived that the quantity of ashes increases as the specific gravity increases, and that the quantity of fixed carbon diminishes as the specific gravity increases. This might possibly not be found to hold good in all coal-fields, though I am inclined to think that in the same coal-field the relations of different plies will be found to confirm the same general law.

In comparing the results in the above table with those of other experiments on anthracite, I find the average amount of carbon much greater than has heretofore been assigned to that species of fuel.

Thus of twelve species of anthracite analyzed by Berthier, the mean per centage of carbon was 79.15

Ashes, 13.25

Volatile matter, 7.37—99.71

It hence appears that while the quantity of volatile matter is widely different from that which I find as the average amount of the same material in the coal of the Summit Company, the proportion of ashes is nearly three-and-a-half times as great.

By a mean of seventeen trials on the coal of different beds at Tamaqua, Messrs. Bache and Rogers found the proportion of ashes 7.3 per cent., or a little less than twice as much as the average of my four analyses of the *summit* coal of Beaver creek.

No. 5. This specimen was taken from a pit opened on the lands of Cornelius Stevenson, Esq., on the northerly slope of the bluff above described, but not far from the top of the ridge. The bed has at this point a northerly dip, and consequently confirms the view above given in regard to the general arrangement of strata.

The coal is compact, shining, of a bluish-black; its specific gravity is 1.6127; a cubic foot of it will weigh 100.79 lbs., and a cubic yard 2721 $\frac{1}{3}$ pounds.

When heated to redness, the specimen which I analyzed, and which was taken from the bed only a few feet from the surface of the ground, or outcrop of the coal, and was consequently more charged with moisture than the generality of the coal would be, gave of water at 550°, 5.68 per cent.

Combustible carbonic oxide, and a little carburetted hy-

drogen expelled at red heat, 3.55

Carbon, not volatilizable by simple heat, 86.06

Earthy matter, 3.71

100.00

The ashes of this coal are of a salmon colour, moderately light, and contain the following proportions of their several ingredients, viz:

Silica,	50.05	per cent.
Alumina,	29.04	"
Peroxide of Iron,	8.75	"
Lime,	1.56	"
Magnesia,	1.30	"
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	99.70	

The small proportion of earthy matter found in this coal, with the very slight trace of sulphur observable during the combustion, mark it as properly adapted to the purposes of the founder and iron manufacturer, as well as to domestic consumption. I see no reason to doubt, that in all respects it will bear a favourable comparison with the best varieties of coal found in the district of country in which it lies. Few, if any, anthracite districts have fallen under my observation, which possess a less share of earthy ingredients. And viewing its relation to the anthracites of other countries, we may state that of twelve varieties of that fuel analyzed by M. Berthier, the result was found to be

In <i>Carbon</i> , highest	.913	lowest, .665	mean, .791
In <i>Ashes</i> , "	.249	" .027	" .732
In <i>Vol. mat.</i> "	.135	" .022	" .073

No. 6. This specimen of coal was from the lands of the Buck Mountain Coal Company, near the head waters of Laurel run, and at a distance of about five miles from the locality of those above described. It is in fact in the prolongation of that coal trough, in which the Hazleton and Sugar Loaf mines are situated, and is near the south-eastern extremity of the deposite. The bed there dips to the north in an angle of about fourteen degrees.

This sample came from the bed twenty-two feet in thickness, lying thirty or forty feet above the conglomerate rock which appears to be the boundary of the coal formation, and from the lowest ply, except one, in that bed. The thickness of this ply is over seven feet. The distance from the point where the mine is open, to the mouth of Laurel run, down which stream the course of a railroad leading to the Lehigh would lie, is about four miles.

The coal is compact, and of a nearly uniform black colour; shining; fracture uneven, splintery, indifferent in its direction, and seldom conchoidal in its form. Though the surfaces of deposition are discernible by the differences of colour, there appears to be no tendency to cleavage in the direction in which they traverse the coal. Its specific gravity is 1.559, and consequently one cubic yard will weigh 2630 pounds.

Its constituents are,— <i>water</i> ,	0.390	per cent.
Gaseous matter, including some azote, volatile at } bright red heat,	5.515	"
Carbon, not volatilizable by heat,	91.016	"
Earthy matter and oxide,	3.079	"
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	100.	

The ashes are of a reddish-buff colour, rather light, and present some

portions perfectly white. They yielded on analysis the following constituents, viz:

Silica,	45.60	per cent.
Alumina,	42.75	"
Peroxide of Iron,	9.43	"
Lime,	1.41	"
Magnesia,	0.33	"
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	99.52	

The proportion of ashes in this coal is much below that of the average of the anthracites of Pennsylvania. Few even in that part of the central coal district, in which the Buck Mountain Company's lands are situated, will be found to yield either less earthy matter, or more fixed carbon, than the sample above analyzed.

Iron Ores.—The bed of iron ore from which the samples that I have examined were taken, is found on the southern declivity of the bluff, about forty rods northerly from the south fork of Beaver Creek, and judged to be about three-quarters of a mile from the Beaver Meadow Rail-road. With this road the locality can be connected at a very little expense by a branch road. Above the bed of ore is a seam of black dirt of considerable thickness, judged to be the remains of a bed of coal which may possibly be found unaltered at no great distance.

The thickness of the bed of ore and shale is seven feet, and it lies seventeen feet beneath the surface of the ground at the point where it is opened. The inclination of the bed is to the south, but apparently less rapid than that of the surface of the hill, so that if the dip observed in the shaft be maintained for any considerable distance below the present opening, there is reason to suppose that it would *crop out* before coming to the border of the creek. The covering is composed of

3 feet of Earth—surface soil,
6 " Black Dirt,
8 " Slate,
7 " Ore and Slate,
1 inch of Coal,
17 feet of Sandstone.

The first variety which was analyzed gave, by the usual assay in the dry way, the following composition, viz:

Water expelled at 250°,	00.4	per ct.
Carbonic Acid,	26.6	"
Cast Iron,	33.8	"
Earthy matter,	26.64	"
Oxygen,	12.55	"
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	99.99	

This variety of the ore has a light bluish ash colour, is moderately tough before calcination, and possesses a specific gravity of 3.247; consequently, a cubic yard of it would weigh 5469 lbs. or 2.44 tons.

The pig metal given in the above assay is soft, tough, and of a dark gray colour, apparently well suited for foundry purposes.

The cinder is a transparent, nearly colourless, glass,—very fusible and contains but few adhering particles of metal.

The employment of pure carbonate of lime as a flux in the proportion of

one part of this metal to six parts of raw mine will produce a complete reduction of the ore and fusion of the earthy ingredients. In using the anthracite No. 5, above described, a small addition of limestone, to the amount of one per cent. of the coal employed, may be found requisite in order to insure an equally complete fusion of the earthy residuum of the fuel. Assayed in the humid way this ore yields the following results, viz:

	per ct.
Water,	00.40
Carbonate of Iron,	63.20
Carbonate of Lime,	2.50
Carbonate of Magnesia,	2.27
Oxide of Magnesia,	2.00
Silica,	17.50
Alumina,	10.55
	<hr/>
	98.42

The above quantity of carbonate corresponds to 39.1 per cent. of protoxide, or 30.45 per cent. of pure metallic iron which is 3.35 per cent. below the above yield in *pig metal*, or it is 9.9 per cent. of the *pig metal* itself, to be regarded as pure iron matter; which is probably very near the true average amount according to the latest and best analyses. The yield in *iron* is equal to the average of Scotch ores in the neighbourhood of Glasgow.—The latter have a specific gravity of 3.209, according to Dr. Colquhoun. This ore which is the blue clay iron-stone of the coal measures, has therefore the specific gravity, the degree of richness, and the fusibility of the same class of ores found in bituminous coal fields, and there is no doubt, in my mind, that it may be easily and profitably worked.

The second variety of the ore examined, was a sample from the same locality, but from a different part of the bed from that in which the preceding was found. It is of a reddish-brown colour, except the exterior, which is yellowish-red.

The specific gravity of this variety is 2.896.

Assayed in the dry way, it gave, <i>Water</i> ,	13.12 per cent.
<i>Pig metal</i> ,	44.96 “
Earthy matter,	24.804 “
Oxygen,	17.11 “
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	99.994

Of the earthy impurities, there were found insoluble in acids 18.55 per cent. The ore now under consideration, has apparently undergone a change by atmospheric influences, from the condition of a carbonate of the protoxide of iron to that of a hydrate of the peroxide; it is not remarkable that in passing from one of these states to the other, some of the earthy ingredients should have been washed away. The usual tests of lime failed to detect that substance. The cinder had a smoky-gray colour, translucent on the edges, and was a compact glass, moderately fusible.

As the appearance of the cinder indicated, particularly when tested before the blow pipe, and by acid, that some portions of metallic oxide still remained in it, an analysis of this ore was also made in the humid way, which gave the following results, viz:

Water,	13.12 per cent.
<i>Peroxide of Iron</i> , with trace of manganese,	63.65 "
Silica,	13.45 "
Alumina,	8.77 "
Magnesia,	1.01 "
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	100.

The quantity of peroxide of iron corresponds to 44.55 per cent. of *iron*, or .41 per cent. less than that of the metal actually obtained. Hence it appears that the quantity of iron remaining in the cinder is very nearly equal to that of the carbon, &c. in the pig metal.

There seems, from all the above statements, to be no reason to doubt that when brought into use, this ore will prove every way competent to sustain a character equal to that of any other argillaceous carbonate of iron, whether of the bituminous, or the anthracite coal districts. I am not aware that the samples which I took from the mouth of the pit were other than fair representatives of the general character of the bed from which they were raised. It is probable that when explored so far as to be under an extensive solid covering, it will be found to correspond more nearly to the character indicated by the former than to that given by the latter of the above analyses.

Near the second bed of coal opened on the slope of the hill north of the northern branch of Beaver creek, I found some iron ore thrown out in excavating a coal shaft. It was all in the state of brown hydrate, and though too much exposed near the surface to allow of the formation of any just estimate of its quantity in the solid part of the bed, where, doubtless, it will be found in the state of a carbonate, yet the size of the specimens which I observed, and their structure, led me to suppose that it could not belong to a trivial, or chance, deposite. This opinion is strengthened by the fact that a bed of seven feet in thickness of iron ore and iron slates is found, as already described, on the opposite side of the bluff, and not more than a mile distant.

The ore submitted to analysis, is of a brown, or yellowish-brown. colour, compact, with small shining particles. Its specific gravity is 3.555.

At a temperature of 330° it loses in moisture,	0.55 per cent.
By strong calcination, it loses of water,	10.048 "
It contains of Peroxide of iron,	71.12 "
Earthy impurities,	18.382 "
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	100.

Of the earthy matter, 13 per cent. are insoluble in acids, being chiefly silica, and 5.382 per cent. are alumina and magnesia; no lime was detected; and but a trace of manganese.

The quantity of pig metal obtained in my analysis was 49.77 per cent.; its colour dark gray; structure crystalline, granular. It was soft, tough, and well adapted for foundry purposes. The cinder was a perfect glass, translucent on the edges, of a smoky colour, readily fusible before the blow-pipe, and, consequently, it presents no obstacle to the free running of iron in a furnace. The result of this trial is such as in my opinion, to justify a careful examination to ascertain the quantity of ore to be obtained in this locality. Being in the immediate vicinity of the richest of the

coals above described, it will be a highly valuable resource, if it shall be found in beds of such thickness, and with such accompaniments, as to render its attainment not too expensive. This point will be determined only by actual searches.

SECTION OF MUSHANNON HILL NEAR KARTHAUS.

Nº	NATURE OF MATERIALS.	Thickness		Elevation above the Susquehanna
		Feet	dec.	
				564. 94
1	Top or highest Covering	78. 00		
2.	Slate	1. 00		486. 94
3	Six Feet COAL Vein	6. 00		485. 94
4	Fire Clay	2. 50		497. 94
				477. 44
5	Brown Sand Rock	45. 00		
6	Coal	0. 85		432. 44
7	Fire-Stone	2. 00		431. 61
8	Lime-Stone	3. 50		429. 61
9	Ore ground, containing Balls	1. 00		426. 11
				425. 11
10	Brown Sand Rock	24. 78		
11	Three Feet COAL Vein	3. 00		400. 33
12	Slate	1. 50		397. 33
				395. 83
13	Grey Sand Rock	37. 20		
14	Three Feet COAL Vein	3. 16		358. 63
15	Ore Ground, containing 26 Inches Kidney Ore	11. 00		355. 47
16	Little Vein of COAL	1. 00		344. 47
				343. 47
17	Brown Rock	20. 73		
18.	19. 20. 3½ Feet COAL Vein	1. 00		322. 74
		0. 25		321. 74
21	Fire Clay	2. 50		318. 99
				316. 49
22	Brown Rock	35. 28		
23	1½ Feet COAL Vein	1. 50		281. 21
24	Fire Clay, mixed with Iron Ore	3. 00		279. 71
				276. 71
25	Red Vein, Iron Ore Formation, cont ^d 25 Inch ^s Ore	11. 72		
26	Slate	5. 00		264. 99
27	Ore Formation & Clay or Shale	3. 50		259. 99
28	Slate	6. 00		256. 49
29	IRON or (Clyde)	— 83		250. 49
30	Iron Ore Formation Mine ground	2. 50		249. 66
31	Black Slate	6. 00		247. 16
32	COAL	1. 33		241. 16
				239. 83
	8 Veins Total of Coal Proved 20 Feet 32.			
33	Unproved Strata	239. 83		

8 Veins

----- Total of Coal Proved 20 Feet 32.---

53

Unproved Strata

259. 85

53

REPORT

OF

AN EXAMINATION

OF THE

MINES, IRON WORKS, AND OTHER PROPERTY BELONGING TO

THE

CLEARFIELD COKE AND IRON COMPANY,

TOGETHER

WITH SOME EXAMINATIONS OF THE MINERALS EMPLOYED IN THE
MANUFACTURE OF IRON FOUND AT KARTHAUS AND
THREE RUNS, ON THE WEST BRANCH OF
THE SUSQUEHANNA RIVER:

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ACCOMPANIED BY A SECTION OF THE MINERAL GROUND.

BY WALTER R. JOHNSON, A. M.,

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PHILADELPHIA:

LYDIA R. BAILEY, PRINTER, NO. 26 NORTH FIFTH STREET.

1839.

Philadelphia, November 2, 1838.

TO THE CLEARFIELD COKE AND IRON COMPANY.

GENTLEMEN,

Agreeably to your request, I have visited the scene of your operations in the manufacture of iron with coke at Karthaus, on the West Branch of the Susquehanna river.

The view expressed by you in proposing this examination, was to ascertain as far as practicable the condition, advantages, and prospects of the position for the purpose of prosecuting on an extended scale the manufacture of iron in its various branches.

In endeavouring to ascertain the present condition of the place, I have sought information relative to the furnace-stack and appurtenances, the blowing and the heating apparatus, the amount of minerals now ready for use, the quantity of blast which the stream could supply, the state of the underground workings, the means of supplying minerals, the accommodations for miners, furnace labourers, and others.

The furnace-stack is apparently in good condition. Some fissures of no great importance are visible, which may generally be found in similar establishments. The in-walls appear to be good. The hearth is removed, and stones enough are now quarried near the furnace to replace it. The labour of dressing these stones will probably require eight or ten days to complete it. The stone used is a yellowish white, coarse fossiliferous sandstone, lying underneath most of the beds of coal, the colour being probably due to an admixture of oxide of iron. Very large carbonized vegetable fossils are occasionally met with in working the stone. The two circumstances just mentioned, appear to me unfavourable to the durability of this stone in the fire, though not easily affected by mechanical agencies.

The height of the stack is forty-five feet, the diameter of boshes thirteen feet. The height of the lintels from the top of

the stone constituting the false bottom is ten feet. This on the side of the cast-house, brings it rather too near the fire in scaffolding out, &c., and has caused the plate to be heated, and to yield in some measure to the weight above. As the bottom stone will be raised by the contemplated insertion of the hot air-pipe beneath it, I think it may be found advantageous to raise the lintel eighteen inches, which can be done with great ease and without much expense, as it does not extend far into the wall.

The stack is arranged for three tuyeres, and the plan of introducing the hot blast now in progress of execution, contemplates the use of one heating oven on the Calder plan, to furnish hot air for all three of the tuyeres.

The casting-house and bridge-house, are both in sufficiently good condition to prosecute operations. The water-wheel would be improved by calking the joints of the soling; and the building which contains it and the blowing machinery, requires to be more effectually covered in order to defend it from cold in winter, and to allow the application of a heating apparatus to secure it completely from freezing.

The oven for hot air is completed so far as the same can be done without the iron pipes. The present mode of connecting the blowing cylinders with the tuyeres, is through conduits of wood, formed in part by plank and in part by logs hollowed out into tubes in two semi-cylindrical portions, adjusted and bound together with iron hoops. This method is found very defective in consequence of the porousness of the wood, and its liability to shrink or expand by alternations and variations of heat and moisture. A short section of from sixteen to twenty feet of twelve inch cast iron pipe, would obviate the necessity of using a wooden pipe altogether.

I made observations on the action of the blowing machine, which, with the whole force of the stream supplied by the run, was found capable of discharging through a $4\frac{1}{2}$ inch nozzle, and through the various leaks of the wooden pipes, 4,700 cubic feet of air per minute. The pressure was not however noted; and for reasons sufficiently obvious in the condition of the wooden pipes, it was evident that this result could be considered as only approximate.

There is no doubt in my mind, that the water-wheel is abun-

dantly sufficient to produce the effect required of it in blowing this furnace, and the refinery fire about to be put into action. An improvement in the dam which would save a considerable quantity of water now lost by leakage, would insure this result at all seasons. This improvement might be made at an expense of from one to three hundred dollars. The blowing cylinders, sixty-two inches in diameter by six feet length of stroke, are in good order and well established, but the packings of the pistons and valves require to be re-examined and adjusted before again putting the furnace in action.

The amount of materials now mined,* and either ready for use at the tunnel head of the furnace, or lying on the bank, was stated to me by the mine manager to be as follows, viz.

Coke,	39,642 bushels,
Iron ore,	2,080 tons,
Limestone,	500 tons.

Admitting that the furnace makes, when running with a fair yield, 63 tons of pig-metal per week, the above mentioned materials would probably last for the following times, viz.

The Coke,	55 days,
Limestone,	55 days,
Iron ore,	77 days.

A large quantity of small coal has resulted from the mining operations, a part of which can be employed for calcining the ore, and the remainder be used for coking in ovens, whenever these shall have been erected. The value of this material should not be lost sight of in estimating the condition of the establishment. The coal and ore mines and the limestone quarries are all opened on the face of the hill in which they are found, opposite to that on which the furnace is situated. This circumstance and the present mode of transportation, requires the materials to be hauled on a circuitous, descending road nearly to the level of the river for one mile, and then hauled for one-fourth or one-third of a mile upward to the tunnel head of the furnace—a vertical elevation of from fifty to sixty feet.

The openings are well executed, and the drifts so arranged that the materials can be supplied in any quantity required for the establishment.

* These quantities have been greatly increased since the date of this Report.

The six feet vein of coal, from which the fuel has hitherto been derived, is among the most commodious beds of bituminous coal which have fallen under my observation—with but little useless matter, a good roof, and little or no water to impede the operations of the miner. An opening of this bed has recently been made nearer to the furnace than any hitherto worked, and which can supply the whole demand of the establishment. An opening has also been made, but not worked, on one of the ore beds on the side of the hill next to the furnace.

All the materials may, for ought I can discover, be as well taken out on this side of the hill as on the opposite.

The accommodations for miners and others about Karthaus, of which the Company have the use, are comprised in twenty-two houses, including two which are used as boarding-houses, and one partly used as a store. Of these, six new miners' houses are on a tract of 170 acres of land belonging to the Company, immediately adjoining the Karthaus property, and more conveniently situated for the accommodation of the miners than any others in the place, being on the level of the mine openings.

The stable near the furnace is judged to be insufficient for as many horses as the present system of hauling the minerals would require, especially if the coal in its raw state were taken to the tunnel head to be coked. There are but few horses or other animals belonging to the Company, and the same is true of the common wagons.

The work of hauling is understood to have been done by contract, at the rate of from fifty to sixty cents per ton. If the furnace were in full action, making as above supposed 63 tons per week, there would be required per annum 26,015 tons of the different materials, which, at the lowest of the above rates, would cost for hauling, 13,007 dollars.

The advantages of Karthaus, as a position for the manufacture of iron on a large scale, are chiefly found in the abundance of all the materials, and their immediate proximity to each other, and to a stream which supplies a competent water power for driving machinery. To render these circumstances efficient and profitable, advantage ought, as it appears to me, to be taken of the great facilities which the height of the ground in which the minerals lie, affords for carrying them by the mere force of gravity to the spot where they are to be used.

A conviction of the importance of this subject, has led me to compare the expense of hauling by contract with two other methods which may be adopted.

For this purpose I ascertained the first cost and the annual expense, first, of the necessary teams, including horses, wagons, gears, and drivers; and secondly, of a self-acting inclined plane on the slope of the hill from the level of the highest mineral bed to that of the tunnel head of the furnace, and of the roads to connect it with the latter as well as with the mouth of the drift. In the latter case the price of some additional cars was also taken into the account.

The plan of maintaining at the Company's own expense the necessary teams, will require an immediate expenditure of	-	-	-	-	\$ 3,340 00
That of making the inclined plane, rail-road, and cars, with the keeping of three mules or horses to draw empty cars,	-	-	-	-	5,321 00
Making a difference in first cost, in favour of the former, of	-	-	-	-	\$ 1,981 00

The annual expense, however, of maintaining the former of these systems, including the pay of teamsters, the support of horses, the renewal of wagons and worn-out horses, the repair of wagons and gears, and the interest on first cost, will be	-	-	-	-	-	\$ 10,223 00
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The annual expense of the inclined plane, cars, plane managers, and all others required to work the system, with the interest on first cost and the allowance for repairs to the road and cars,						3,363 00
Showing an annual difference in favour of the latter system, of	-	-	-	-	-	\$ 6,860 00

From the above statement, it appears that the hauling of the minerals by contract, is more expensive than it would be by the Company's own teams and common wagons, by the sum of						\$ 2,714 00
And more expensive than the inclined plane by						9,652 00

The estimate for a rail-road is made upon a basis at which contracts can at any time be obtained for executing the work. The total distance from the bank where the ore is now roasted at the tunnel head of the furnace, to the new opening above designated in the large coal bed, and which is the most remote point to be reached by the rail-road, is only 2,226 feet, or about two-fifths of a mile. From this it will appear that the inclined rail-road is estimated at 12,600 dollars per mile, which for this purpose is believed to be amply sufficient, since all the timber for the construction can probably be obtained within half a mile of the line, and the labour of grading is quite insignificant. The bridge across the creek will be built on tressels, ten feet apart, and on this the part of the rail-road adjoining the furnace will be laid. This improvement being adopted, the calculated expense of making a ton of pig-metal will be reduced to \$12 87.

The expense of making a ton of iron, has been thus calculated.

The quantity of materials required for one ton of pig-metal, has been found by experience to be as follows, viz.

- 3 Tons of raw mine,
- 3½ Tons of raw coal,
- 1 Ton of limestone.

The mining of the ore costs, on an average, \$1 75 per ton, and three tons cost	\$5 25
The mining of the coal costs, on an average, 70 cents per ton, and 3½ tons cost	2 45
The mining of the limestone costs \$1 12½ per ton,	1 12½
Hauling, by the Company's own teams, 7½ tons, at 38.6 cents per ton,	2 89½
Furnace labour, 13 hands, at an average price of \$1 40 each per day, the furnace supposed to make 9 tons per day, or 63 tons per week,	2 00
Add for compensation of mine manager, furnace manager, and all other hands not included in the above estimate,	1 00
Amount carried forward,	<hr/> \$14 72

Amount brought forward,	\$ 14 72
Should the system of transportation recommended in this Report be adopted, it is calculated that a saving of 24.6 cents per ton will be effected upon all the minerals, reducing thereby the expense of the ton of pig-metal by - -	1 84½
And consequently bringing its cost to -	\$ 12 87
as above stated.	

The reducing of pig-metal to malleable iron, and the means of making bar and plate iron, have no doubt occupied the attention of the Company. The refinery partly completed for this purpose near the furnace, will afford an opportunity of testing the value of the stock of pig-iron, amounting to 700 or 800 tons, already manufactured and lying near the furnace. Though possessing in its present state the properties of hardness and brittleness, characteristic of *white* or *high* iron, this does not necessarily result from the quality of the materials found at Karthaus, excellent gray iron having been made there;* but even were it so, it would not prove its inferiority to other establishments for the manufacture of bar-iron.

Experiment has proved that bar-iron manufactured from *white pig*, is rather superior than otherwise to that made from mottled gray or black, if the whiteness be not due to noxious ingredients.

Some of the most celebrated varieties of bar-iron in this country, are made from *high* iron. In the refining process, all pig-metal assumes more or less the state of white metal. In Europe, iron of this description is converted into articles demanding the greatest tenacity.

Before leaving the subject of the Karthaus property, I should remark that the new openings of both ore and coal above the furnace near the turnpike, have exhibited abundant supplies of both materials, which can be easily mined and brought to the tunnel head by a continuous descent. The land is too low to possess the upper thick vein of coal found at the old workings,

* Since writing the above, the various ores have been analysed, and it has been ascertained that the *whiteness* has been produced by the use of ore from a bed that was not known to exist when the gray metal was made.

but the quality of that which is obtained is good; and the slightly enhanced cost of extracting it will be thrice counterbalanced by the reduced expense of hauling from this place rather than the other. The proposed rail-road may thus be rendered less necessary.

The property of the Company adjoining Karthaus, immediately below on the river, having above a mile of river-front, containing about 158 acres, with all the mineral beds of value, both of iron ore, coal, and limestone found at Karthaus, except the upper vein of coal which appears to have been washed away from this part of the ground, is well situated for an iron establishment, embracing both furnaces and forges. The southern extremity of the property is formed by a low projecting point of land, round the extremity of which the river flows over a considerable descent, forming what is called "Tinker's Ripple." Along the brink of the stream lies a bank of earth some fifteen or twenty feet high, and of various width, separated by a natural canal or race from the rocks behind it, and affording an opportunity, by a little labour, to form a mill-race through which any desirable portion of the water of the river might at all seasons be made to pass. The fall here attainable, is judged to be not less than from eight to twelve feet, and the site is well adapted for a rolling-mill or common forge.

A cleared and pretty well cultivated farm lies in the rear of this property, which it is believed can be bought at a reasonable price, and which would afford a considerable amount of agricultural supplies to the establishment. Being in general about at the level of the limestone bed in the formation, the soil is highly propitious to vegetation.

In conformity with your request, I visited the property at Three Runs, and found the situation certainly not less advantageous than Karthaus, for the location of iron works. It has all the varieties of minerals found at the former, in apparently much greater amounts, owing to the quantity of land over which they extend. The six feet vein of coal is probably under about eighty or ninety feet of cover; and the fall of the river between this point and Karthaus, a distance of six miles, is such as to have revealed a lower vein of nodular or ball ore, which at Karthaus is below the bed of the stream.

This property enjoys nearly three miles of river-front, receives

two of the three runs from which the place derives its name, has nearly one hundred acres of slope or bottom land, affording a good site for a town or village; has the whole length of Buttermilk Falls, extending round a point very similar to that already described at "Tinker's Ripple," but with a fall of at least fifteen feet; of the whole of which advantage may be taken through a natural race-way, precisely similar to the one already mentioned. Each of the two runs will be valuable for many mechanical purposes, but is not such a stream as I would recommend for driving the blowing machinery of a blast furnace. For this service, the moving power ought to be subject to as little variation as possible, or to be at least capable of complete regulation.

I see no difficulty in the way of erecting here, when means shall be provided, three or four blast furnaces, so near each other as to derive their blast from the same machine.

I would remark, that the land at Three Runs is well timbered, and that the larger of the two streams on the Company's property would afford eligible sites for saw and grist mills, which I consider indispensably necessary to such an establishment as is contemplated at the point in question. The water-wheel first erected at Karthaus would be adequate to one of these purposes, or to any other within the limits of its capacity, and might easily be removed to such a situation as the case might demand.

It has not unfrequently been mentioned, as an objection to Karthaus, that it is difficult of access, remote from market, and in a region where supplies are not easily attainable. It is twenty-seven miles by the turnpike from Bellefonte, or twenty-five from Milesburg, the present termination of the Bald Eagle navigation, which furnishes from that point a continuous water communication, through the state works and tide canal, with tide-water at Havre de Grace.

The distance to tide by this route is two hundred and forty-seven miles. The distance from tide to the mouth of the Sinnemahoning, is two hundred and thirty miles by the course of the river, and the lockage six hundred and seventy-eight feet. To this point the West Branch Canal is now placed under contract, and in the course of execution.

From the mouth of the Sinnemahoning to Three Runs, the dis-

tance by the course of the river is fourteen miles, and to Karthaus twenty miles; hence Karthaus is two hundred and fifty miles from tide-water, and on a stream which is descended by rafts and arks in immense numbers at high stages of the river. The grade of a rail-road, from Three Runs to Sinnemahoning, would not probably exceed, if it even equalled, six feet to the mile; and the grading would present no difficulties comparable to those which are encountered on the public works in many other places. I state this from *information*. When the Erie Rail-road shall have been completed, a rail-road from Three Runs to the mouth of the Sinnemahoning, will afford a direct connexion between that point and the great lake country of the north-west. The completion of the canal to Pittsburg, by Mr. Aycrigg's route, will open that important market to the productions of the establishment, besides which the Williamsport and Elmira Rail-road will give a direct communication with the State and City of New York.

It has been stated to me, that goods can be taken in arks from Karthaus to tide, for four dollars per ton, all expenses included, and that the season of running arks is five or six weeks in the year upon an average. Thus it appears that proper arrangements being made, the bituminous coal field of the great Clearfield, or West Branch Basin, will be opened to New York, Philadelphia, Baltimore, the Valley of the Mississippi, and the immense regions bordering on the lakes. To all these it can send rail-road and other iron, over iron roads from its own rolling-mills.

The remoteness from the source of supplies is a temporary inconvenience only, not a natural impediment to the prosperity of the place. There is much good land already under cultivation, within a short distance of the establishment, and a vast region of heavily timbered ground, which only awaits the hand of improvement to make it abundantly productive. Should the Company once establish a well stocked store, and be enabled to supply the adjacent country with iron, and other manufactures, there is no doubt that supplies would flow in upon them far beyond their necessities.

From observation and inquiry, I am satisfied that a much more eligible line for a road, between the Three Runs and

the Valley of the Bald Eagle, by way of Beach Creek, might be opened, than that furnished by the Snow-shoe and Karthaus turnpikes. Such a road would lead through the Boudinot lands, and be of immense importance to the interests of the City of Philadelphia.

I will now state some of the improvements which my visit has suggested, in the arrangement and accommodations of the establishment.

1. The completion of the apparatus for the hot-blast.
2. Substitution of iron conducting-pipes for those of wood.
3. Hempen or metallic packing, for the blowing-cylinders.
4. Finishing the refinery.
5. Construction of a good cupola for making the castings required by the Company.
6. An inclined-plane and connecting rail-roads to the mines.
7. Repair of the dam at Karthaus, and an increase of its height.
8. A furnace on the Company's property, just below Karthaus.
9. A forge, with the requisite number of fires, at "Tinker's Ripple."
10. A rolling-mill, with the necessary puddling-furnaces, and an air-furnace for making rail-road iron, &c., at Buttermilk Falls.
11. A shop, for making the necessary machinery.
12. Four furnaces at Three Runs, blown by one steam engine.
13. A saw-mill and grist-mill at Three Runs, which will pay their own cost and expenses.
14. A good store for country customers, as well as to supply the works.
15. A good house for the accommodation of travellers and visitors.
16. A respectable agent's house, and some additional houses for miners.
17. A farm to be cleared on the flats at Three Runs.
18. An assaying-furnace, and small chemical apparatus for testing materials.

To these items I may add, that a bridge across the river at Karthaus is believed to be all that is now necessary to complete the turnpike communication between Bellefonte and Smethport, on which Karthaus would be the most important intermediate point.

To accomplish all these purposes, a sum within the legal limits of the Company's capital will, I think, prove amply sufficient; especially as nearly all the improvements are of such a nature as to be produced on the spot, and out of the materials of their own manufacture.

The reply to my inquiries, relative to the prices of provisions at Karthaus, was that, in general,

Potatoes cost	50	cents	per bushel.
Oats	“	50	“ “
Corn	“	75	“ “
Wheat	“	125	“ “
Rye	“	100	“ “
Pork	“	8	“ per pound.
Mutton	“	7	“ “
Veal	“	8	“ “
Beef	“	6	“ “

By procuring the above articles in large quantities, and at proper seasons, especially where they can be brought in upon the snow in winter, a large deduction from the above prices could in general be obtained.

The method of *blowing* in the furnace, heretofore practised, has involved a considerable expense of time and money, which may be spared by commencing the blast with charcoal, and charging at once with all the minerals; a method pursued with entire success in other places. To this method the Company are in a manner invited, by the immense supply of wood which must be cut down to make way for their improvements. By this, and the various other means of concentrating and economizing their operations, the works above designated can in my opinion be prosecuted to such a profit as to answer all reasonable expectations.

A liberal but enlightened expenditure of capital in such a situation, can hardly fail to meet an abundant reward. Nature has done all in her power to make the situation favourable, and has beckoned man to the fulfilment of his part of the duty by indications not to be either mistaken or disregarded.

I am, gentlemen, very respectfully,

Your obedient servant,

WALTER R. JOHNSON.

Analysis of Minerals.

Since the foregoing Report was rendered, I have made an examination of some of the ores, coals, and limestones found at Karthaus Place and Three Runs, from which I am enabled to present the following statement:

COAL.

The bed of coal chiefly relied on at Karthaus for making iron, is the upper or main bed, six feet thick, which lies 80 feet below the surface of the summit of Mushannon Hill, and 497.94 feet above the level of Susquehanna river, as represented in the accompanying Section.

This coal I find has a specific gravity of from 1.250 to 1.278. It loses in water, during the process of dis-

tillation, -	-	-	-	-	-	-	0.6	per cent.
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It loses in carburetted hydrogen and other

volatile products, -	-	-	-	-	-	26.2
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The earthy residuum, after complete incine-

ration, is -	-	-	-	-	-	5.05
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Carbon in the coke, -	-	-	-	-	-	68.15
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100.

The coke is of medium hardness, and in all respects well adapted to the production of iron. The earthy residuum is composed of silex, alumina, and oxide of iron, with a portion of lime and a little magnesia.

IRON ORES.

Ten assays have been made on the ores found on the Company's grounds, of which four were on that of the "Kidney vein," at Karthaus, two on that of the "Red vein," and four on the ores of different beds at Three Runs.

The "Kidney vein" ore is found in different parts of a bed, marked on the accompanying Section of Mushannon Hill as No. 15, at an elevation of $344\frac{1}{2}$ feet above the level of the Susquehanna river. It is 11 feet in thickness, composed of ferruginous and carbonaceous slate, with reniform and some stratified portions of argillaceous iron-ore diffused through it, in all amounting to about 26 inches of ore. This ore-bed has a stra-

tum of coal one foot thick below, and another 3.16 feet thick immediately above it.

The ore is an argillaceous carbonate of iron, or clay iron-stone of the miners.

Its specific gravity is from 3.206 to 3.397, varying with the part of the bed from which the specimen is taken.

Its colour is a bluish-gray; fracture splintery, and occasionally conchoidal—the exterior of weathered specimens covered with a coat of yellowish-brown hydrate of iron.

1. The first assay on a specimen having a specific gravity of 3.397, conducted in the dry way, gave—

Of water, at 320 degrees,	-	-	-	1.2	per cent.
Loss in carbonic acid, by calcination at a red					
heat,	-	-	-	-	26.68
Metallic iron,	-	-	-	-	38.33
Earthy impurities, silica, alumina, &c.,	-				16.67

The pig-metal obtained in this analysis was of a mottled-gray complexion; its internal structure granular, crystalline, moderately tough, and of rather more than medium hardness; it is, however, readily acted on by the file; its specific gravity was found to be 7.726. The cinder indicated that no metallic oxide remained, or, in other words, that the maximum yield of iron had been obtained.

2. This trial was on a portion of the ore of the same bed as the preceding, but the specimen selected was a part of the shell of the carbonate, which in the outcrop assumes the character of a brown hydrate of the peroxide of iron.

Its specific gravity was 3.415.

At 320 degrees it lost, of water,	3.9	per cent.
By calcination,	-	6.72
The metallic iron is,	-	50.6
Earthy impurities,	-	17.1
Oxygen,	-	21.68

100.

The pig-metal obtained in this assay is very soft and tough; its fracture irregular; its colour dark gray, or mottled; structure granular, and rather less crystalline than in the preceding trial. The cinder is a transparent glass, with a slight rose-

coloured tinge, indicative, perhaps, of the presence of a small quantity of oxide of manganese. The specific gravity of the pig-metal was 6.24.

3. The next assay of the ore of this bed was made with a view of testing the efficacy of the limestone of Three Runs and of Karthaus respectively, as fluxes for the ore in question. The specimen now tried was without any portion of hydrate adhering to the exterior; its specific gravity was 3.206.

It lost, by calcination, water and carbonic acid,	27.42 per cent.
Assayed by 11.5 per cent. its weight of the limestone of Karthaus, it gave of metallie iron,	36.1
Earthy impurities, silica, alumina, &c.,	- 26.17
Oxygen,	- - - - - 10.31
	<hr/>
	100.

The pig-metal was mottled throughout, moderately hard; fracture even, and nothing of crystalline structure was perceptible. Its specific gravity was 7.102.

The cinder is a transparent glass, with a tinge of purple.

4. The same ore, treated with the limestone of Three Runs, in the proportion of 11.35 per cent., gave of metallic iron, - - - - - 34.54 per cent.

And the earthy matter, including some protoxide of iron contained in the cinder, amount-

ed to	- - - - - 27.34
Oxygen,	- - - - - 10.70
To which add the loss by calcination,	- - 27.42

100.

The cinder was, in this case, of a dirty green colour, porous, moderately fusible, and rather tough; the pig-metal white, with a few specks of dark gray, producing a slightly mottled appearance.

5. This trial was on the ore from the "Red vein," which is 264 feet above the Susquehanna river, 11.72 feet thick, in which are two separate bands of ore. It is marked on the Section as No. 25. Specific gravity, 3.421.

This is also an argillaceous carbonate of iron, with an inter-

mixture of some pyrites in minute grains diffused through the mass, and having its interstices coated with sulphate of lime.

This and the following assay were intended to afford another opportunity of comparing the limestone of Karthaus and that of Three Runs, as well as to make known the character of the "Red vein," the discovery of which is comparatively recent.

The colour of this ore is of a bluish-gray; its fracture splintery, uneven; surface harsh to the feel; the sulphate of lime in some parts crystallized in thin plates, and in others efflorescent on the surface. In drying at a temperature of 250 degrees, it loses only 0.32 per cent.

In assaying this ore with the limestone of Karthaus, the latter was employed in the proportion of 13.75 per cent. of the raw ore.

The loss by calcination—water, carbonic acid,	
and sulphurous acid,	- - - - 29.06 per cent.
Metallic iron,	- - - - 35.91
Earthy impurities, silex, alumina, and sulphate	
of lime,	- - - - 20.68
Oxygen and other volatile products of fusion,	- 14.35
	<hr/>
	100.

The cinder is black, covered with a pellicle of metal, and is difficult of fusion.

The pig-metal is rather hard, brittle, and white. Its specific gravity is 6.787.

The presence of sulphate of lime had led me to suspect that of pyrites. During the calcination this became abundantly evident, by the application of suitable tests; and a careful inspection enabled me subsequently to detect the minute crystals of sulphuret in the ore.

6. The same ore was assayed by the limestone of Three Runs, in the proportion of 11.28 per cent. of the raw ore. It gave,	
Loss by calcination,	- - - - 29.06 per cent.
Metallic iron,	- - - - 36.07
Earthy impurities, oxide of iron, &c.,	- - 20.38
Oxygen and other gaseous compounds resulting	
from the fusion,	- - - - 14.49
	<hr/>
	100.

The cinder was in this case in part of a dirty yellow colour, in part dark brown, opaque, tough, and easily fusible. The pig-metal did not vary in any important particular from that of the preceding assay. Its specific gravity, however, was 7.272.

7. The next assay was on the compact blue clay iron-stone of Three Runs, found on a bench upon the slope of the hill—its elevation not exactly determined, nor the thickness of the ore bed certainly known, but apparently of a workable magnitude.

This is a compact ore, affecting in its fracture a conchoidal form, occasionally splintery. Its specific gravity is 3.130.

Care was taken to distinguish, in this experiment, between the amount of water and that of carbonic acid. The result was

Hygrometric moisture,	-	-	-	-	0.27 per cent.
Water of composition,	-	-	-	-	2.09
Other loss by calcination,	-	-	-	-	27.67
Metallic iron,	-	-	-	-	33.81
Earthy impurities, silica, alumina, &c.,	-	-	-	-	22.49
Oxygen,	-	-	-	-	13.55
					99.88

The pig-metal is tolerably soft, somewhat malleable, having a dark gray colour; partly crystalline structure, with a specific gravity of 7.00.

The cinder is of a dirty gray, inclining to green; porous.

8. A bank of ore has been recently discovered at Three Runs, lower in the formation than any at Karthaus, and near the level of the river. This stratum is presumed to be disclosed by the greater depth to which, at Three Runs, the river has cut its channel into the general mass of the stratification. The ore is in nodules, generally of small size, often not exceeding one or two inches in diameter. They consist as usual of a shell and nucleus, the latter generally more or less decomposed, but sometimes found very compact at the centre.

The decomposed nucleus is often a white carbonate of iron, with an exterior rose-coloured tinge; shell of a chocolate-brown. The specific gravity of the shell part was found to be 3.445; that of the nucleus, 3.570.

The assay of both the shell and nucleus together, gave the following results—

Hygrometric moisture,	-	-	-	-	0.92 per cent.
Water and carbonic acid lost by calcination,					20.60
Metallic iron,	-	-	-	-	52.42
Earthy matter,	-	-	-	-	9.32
Oxygen,	-	-	-	-	15.84
Loss,	-	-	-	-	.90
					<hr/>
					100.

The pig-metal obtained in this assay is of a dark gray colour, of great toughness, softness, and malleability, and would be suitable for foundry purposes. Its specific gravity is 6.540.

The cinder is a transparent glass, tinged with light pink.

9. The shell part of the above nodular ore was next treated by itself, and gave the following results, viz.

Water lost by calcination,	-	12.70 per cent.
Iron,	-	55.94
Earthy impurity,	-	8.21
Oxygen,	-	23.15
		<hr/>
		100.

The limestone of Three Runs and the coke of Karthaus were used in making this assay, and the cinder obtained was a transparent glass of a reddish tinge, with a pellicle of metal on the exterior. It was easily fused. The pig-metal is very soft and tough; its fracture rough, with a display of occasional crystalline facets; its colour dark gray. Specific gravity, 7.01.

10. The last assay of the nodular ore was on the nucleus part, carefully freed from earthy matter, and from hydrate or peroxide. This nucleus had a specific gravity of 3.570.

It was found to contain of

Water,	-	1.09 per cent.
Carbonic acid,	-	30.41
Metallic iron,	-	38.22
Oxygen,	-	10.92
Earths and trace of manganese,		19.36
		<hr/>
		100.

In this assay the metal was all obtained in small beads and particles—the cinder much mixed with them—and it has therefore been found necessary to estimate the last two ingredi-

ents from a knowledge of the first three items. The 8th assay being made on a specimen of ore partly composed of carbonate and partly of hydrate, gave, as might be expected, a result intermediate between those of the 9th and 10th.

LIMESTONE.

1. The limestone found in the Mushannon Hill at Karthaus, as seen at No. 8 of the accompanying Section, 426.11 feet above the level of the river, and $3\frac{1}{2}$ feet thick, possesses a specific gravity of 2.78.

It loses, by calcination, water and carbonic acid, 36.37 per cent.

And contains of dry lime,	-	-	-	-	36.08
“ protoxide of iron,	-	-	-	-	6.97
“ silica,	-	-	-	-	12.00
“ alumina and manganese,	-	-	-	-	8.58

100.

In heating strongly, to expel the last portions of carbonic acid, the lime, previously reduced to powder, became partially agglutinated, together evincing an incipient fusion.

2. The limestone found at Three Runs has a specific gravity of 2.70; is of a yellowish colour and compact structure.

It loses, by calcination, water and carbonic acid, 32.7 per cent.

And contains of dry lime,	-	-	-	-	34.5
Silica,	-	-	-	-	21.0
Protoxide of iron,	-	-	-	-	6.3
Alumina, with a little magnesia,	-	-	-	-	5.50

100.

The above analyses appear to me to point to the cause of the peculiar character of the iron, found to be produced in one or two of the recent blasts of the Company's furnace. The ore of the “Red vein” contains a portion of sulphur, which the treatment of the minerals, before smelting, did not expel. My analyses of the ore of the “Kidney vein” did not detect the same ingredient in the contents of that bed. In the earlier blasts of the furnace, the “Red vein” ore was not used, and then the iron was gray, soft, and good. The *white* metal is believed to have been chiefly if not entirely produced, since the “Red vein”

ore has been mixed with the other. It appears that the lowest yield of the ore, either at Karthaus or Three Runs, is $34\frac{1}{2}$ per cent. of pig-iron, and the highest, 56 per cent., very nearly; hence, unless extraordinary imperfection exist in the running of the furnace, the quantity of raw mine required for the ton of pig-metal, ought in no case to exceed that stated in the preceding Report; and it may probably be found, that $2\frac{1}{2}$ tons will often suffice for this purpose, especially when a portion of the outcropping ore is mixed with the more solid parts. The nodular ore recently opened at Three Runs, whether treated with pure carbonate of lime, or with the limestone of its own vicinity, yielded an iron of excellent quality, and varying in quantity from 38 to 56 per cent. of the ore employed.

A more minute analysis of the cinder and of the residuum of the coal, to determine the best proportion of the different ores, and the quantity of flux necessary for their reduction, may hereafter be requisite, in order to the economical conduct of manufactures. Enough, however, has been shown, to indicate the intrinsic value of the materials, the fitness of several of them for making both forge and foundry iron, and the cause of unsuitableness in others for the like employment. Other varieties of ore than those already named, are known to exist in the neighbourhood, and have been formerly employed in the manufacture of iron at Karthaus, when good foundry metal was produced. On the whole, I see no reason to suppose that the pig-iron made at these works will necessarily be less valuable than that produced in other countries,* where coal and iron occur in juxta-position, and where immense quantities of the best forge and foundry iron are produced.

I remain, gentlemen, very respectfully, your's,

WALTER R. JOHNSON.

Philadelphia, February 2, 1839.

* The mean yield of the ores of Wales is 33 per cent., that of those in Staffordshire, 30 per cent.—See *Voy. Metallurgique of Dufrénoy and others*, p. 100.

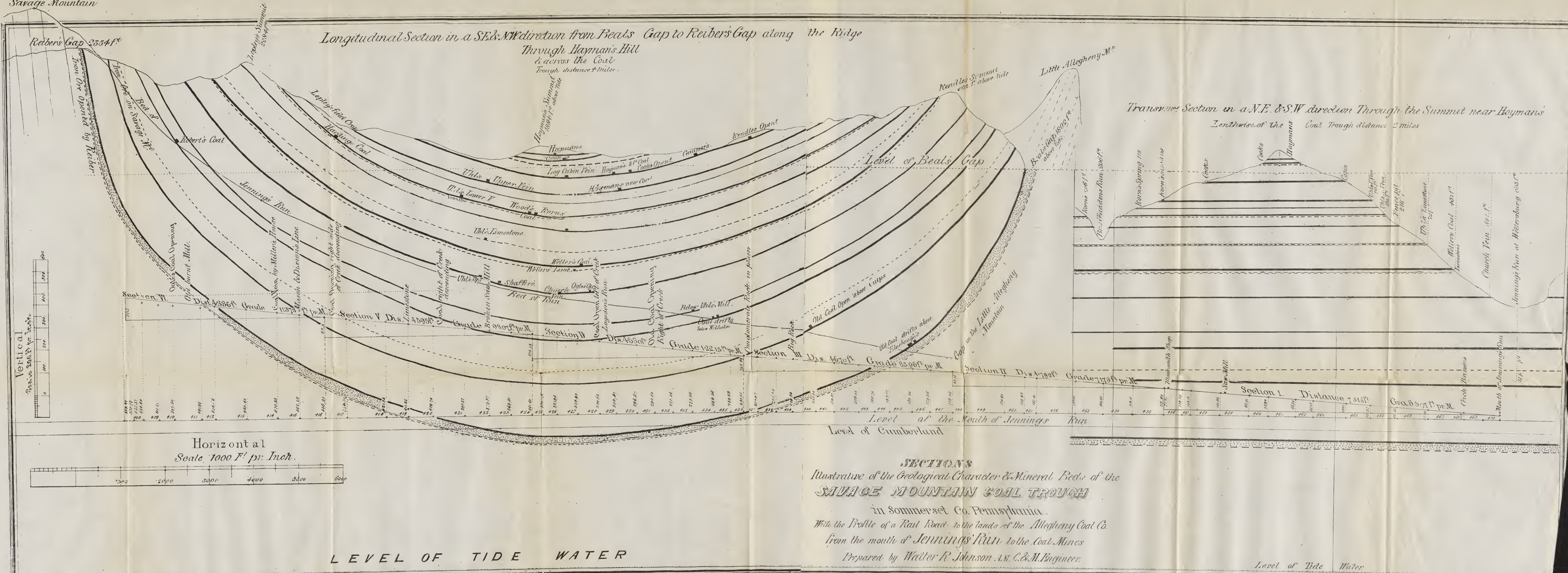
By the mean of sixteen analyses by Berthier, the quantity of *protoxide of iron* in the carbonates of France was found to be 39.075 per cent., which corresponds to 30.4 per cent. of metallic iron; and by the mean of eight analyses of the carbonated ores in the neighbourhood of Glasgow, by Dr. Colquhoun, the quantity of protoxide is 42.82 per cent., equivalent to 33.3 per cent. of iron.—*Thomp. Min.* Vol. I. p. 446-7.



MAP
 OF THE COAL AND IRON DISTRICT
 OF THE CARBON CREEK.
 BRADFORD COUNTY PENN.
The property of the
 TOWANDA RAILROAD
and
 COAL COMPANY.

To accompany a report of Exploration
and Survey.
By
WALTER R. JOHNSON.





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In the Summit near Hoyman's
2 miles

REPORT

OF A

GEOLOGICAL, MINERALOGICAL, AND TOPOGRAPHICAL
EXAMINATION

OF THE

COAL FIELD OF CARBON CREEK,

THE PROPERTY OF THE

TOWANDA RAIL ROAD AND COAL COMPANY,

BRADFORD COUNTY, PA.

WITH

AN ANALYSIS OF THE MINERALS.

ACCOMPANIED BY

A MAP OF THE SURVEYS, PROFILE OF THE ROAD,

AND

SECTIONS OF THE MINERAL GROUND.

BY WALTER R. JOHNSON, A.M.

Civ. and Min. Engineer; Professor of Chemistry and Natural Philosophy in Pennsylvania College,
Philadelphia; Late Professor of Mechanics and Natural Philosophy in the Franklin Institute;
Member of the Academy of Natural Sciences of Philadelphia, &c. &c.

PHILADELPHIA:

JOHN C. CLARK, PRINTER, 60 DOCK STREET.

1840.

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REPORT.

To the President and Directors
of the Towanda Rail Road and Coal Company.

GENTLEMEN,—Having been engaged in the service of your Company to examine the lands belonging to the same; to make preliminary surveys for a route by which a rail road may be made to connect the property of the Company with the State works; to ascertain the extent and character of the mineral beds, and their value; I now beg leave to submit the results of my surveys, explorations, and analyses.

The situation of your property is, in many respects, advantageous. It appears to be the north-easternmost of that series of coal deposits, which stretch nearly the whole length of the State of Pennsylvania, on her northern border. It is at a very moderate distance from one of our great lines of public works, which connect it immediately with the central thoroughfares through our own state, and with the important improvements, the flourishing population, and extensive manufacturing districts of the State of New York.

The situation above represented, will at all times secure to the products a market independent of the fluctuations of foreign trade, and being nearer to the same market than any other known locality of bituminous coal formation, will be at all times able to command reasonable and profitable prices. The borough of Towanda, at or near which the rail road contemplated to be made from the Company's property would be connected with the North Branch canal, is about 16 miles by the course of the river from the New York state line. This borough has enjoyed a rapid growth, and has participated largely in the lumber trade. It is the seat of justice for Bradford county, and is distinguished for the liberality, intelligence and public spirit of its inhabitants. The village of Munroeton, about four miles south-west of Towanda, is likewise a thriving village, extensively engaged in the lumber trade; this village lies very near the line of the rail road proposed to be constructed by the Company, and will consequently

be enabled to avail itself of the facilities which that road may offer for transporting to the public works or to the Susquehanna, the great amount of lumber annually accumulated there.

The delta of land between the Towanda creek, the river Susquehanna, and the road leading from Towanda to Munroeton, is a beautiful tract of exceedingly fertile land, and, together with the extensive valley of the main Towanda creek, will afford large supplies for any establishments which the Company may think proper to make, on their property, until the latter shall have been cleared and placed under cultivation. From the State of New York also, abundant supplies of provisions and other necessities may be expected by the way of the river and the public works, in return for such minerals and other productions as will be furnished by the works of the Company.

The market for iron, when the manufacture of that article shall have been established, cannot fail to be extensive, as the supplies of that necessary article for an extensive and populous region, are now brought from great distances.

GEOLOGICAL CHARACTER OF THE DISTRICT.

The property of the Company to which my attention was mainly directed, is situated in the north-easterly portion of a secondary formation, embracing a coal field of about two or three miles in breadth, and at least six or seven in length, its western termination beyond the Company's property, not being hitherto accurately defined. Its northern or north-western border, is along a high and tolerably uniform and continuous ridge of mountain, south of the valley of Towanda creek. On this creek itself, the lower beds of limestone and sandstone underlying the coal measures, are found at a high angle of inclination, often not less than 40 or 50 degrees towards the south or south-west. On the easterly and south-easterly parts of the coal field, on the contrary, we find the dip of the lower rocks to be to the west or north-west, while on the south and south-western parts which I traversed, especially on Burnet's ridge, the slope is evidently towards the north. The coal measures lie on both sides of the Carbon creek, the valley of which, as well as those of its tributaries, is a valley of denudation, made by the action of water, which at the north-eastern extremity of the coal basin, has excavated its channel through the whole coal series, over 200 feet thick, and to a depth of more than 750 feet below them, into the underlying strata of slates, limestones, sandstones, and shales.

The upper bed of coal in this formation, is at an average elevation, by the result of observations at several different openings, of 1219 feet above the level of Towanda. It is under different amounts of covering, from 3 or 4, to 20 or 30 feet in thickness. The lowest of the mineral beds, of which the elevation has been accurately determined, is one of calcareous iron ore found on Fall creek and elsewhere, at the height of 1016 feet above the same level; and as below this, the reddish gray sandstone and red shales succeed, we may be safe in designating the thickness of the whole mineral bearing strata, including the coal measures and their covering, at about 220 feet.

The thickness of the upper bed of coal, is from 5 to 7 feet, in different portions of the formation which have come under my notice.

At an elevation of $1114\frac{1}{2}$ feet, is a second bed of coal, about 3 feet in thickness; and from the above statement, it will be seen that this places it $104\frac{1}{2}$ feet below the upper bed. This bed is found to repose on a stratum of compact siliceous gritstone, and the latter on gray sandstone, beneath which is found a bed of good fire clay. The latter rests on a bed of clay iron ore, of variable qualities, 9 or 10 feet in thickness. Between the two beds of coal are strata of iron ore, not much exposed to view, but near the northern limit of the coal formation in Mason's beds and elsewhere, I have seen the Kidney ore of excellent qualities fully developed, and possessing the properties which will be indicated in the analyses of minerals contained in a subsequent part of this Report.

The mineral deposits which have been hitherto explored *by excavation*, are situated wholly on the northerly side of the Carbon creek; but, on the southern side, between that stream and the Millstone run, is a district which, so far as the indications of the surface can be relied on, will probably be found more valuable than any other which I have seen on the Company's property; its greatest elevation is almost identical with that of the coal deposits at Mason's mines; and every rock found on the north side of the stream, is also observable on the south side. As all the tributaries of the Carbon creek have, like that creek itself, made their channels by denudation, there is necessarily a considerable space intervening between the several parts where the coal still retains its original position. Of these spaces, those between the upper beds are most extensive, and consequently the lower strata may be expected to furnish the greater amount of minerals. The lower bed of coal is judged to be more than twice as extensive as the

upper. The time allowed for the execution of my surveys, did not permit me to ascertain the exact form of the out-crop of either of these beds; but it may, in general, be stated, that the upper bed has been opened between Coal run and the head of Fall creek, and between the latter and the sources of Long Valley creek. Between the heads of the latter, and of Brush Rock run and Wagner's lick, the elevation and all the exterior indications fully warrant us in the belief, that the upper bed is there likewise to be found, though no direct researches have been instituted to lay open the minerals on these elevated parts of the formation. On a section accompanying this report, will be seen the deductions from actual levelling on both sides of the Carbon; and from a careful comparison of the accompanying rocks, north and south of that stream, the coincidence of the mineral deposits on both sides has been inferred. It has been observed that the coal slate makes its appearance at the surface, on the south side, in localities exactly conformable to those situations at which the beds are opened, on the north side of the creek. It is on the strength of these coincidences in elevation, configuration, and identity of accompanying materials, chiefly, that I have ventured to locate the coal and other beds in the left hand part of the section, at the crossing of Carbon creek, below the mouth of Wagner's run. The right hand side is mainly made from actual survey and observation. Another section is given from actual levelling, commenced at the mouth of, and extended to the head of Fall creek, as well as along the table land beyond the place of its source. I should mention, that I have in my possession samples of coal said to have been found between the Carbon creek and the Millstone run, as well as between the latter stream and the south branch of Towanda creek.

MINERALS.

The most important minerals found in this tract of land, are iron ore, coal, and fire clay. These lie principally in the higher portions of the elevated table land, bounded on the north by that range of mountains which lies on the south side of Towanda creek, and on the south by the line of elevated land known as Burnet's ridge, and sometimes called Allegheny Mountain. The mineral ground is, in all, about 200 or 220 feet thick, including the lowest bed of iron ore, and the highest of the beds of coal with its covering. The character of the coal is indicated by the analyses.

The points at which the coal has been most extensively ex-

plored, are, the heads of Wagner's Lick creek, and Fall creek. At the former are situated Mason's Mines, so called; and, at the latter, are several shafts and drifts, made under the direction of the former owner.

The most important portions of the coal of this formation, appears to be included in two principal beds, known as the upper or "big vein," and the lower or "three feet vein."

The upper bed has been exposed in six or seven different places, and has an average elevation of 1219 feet above the level of Towanda.

The lower bed, where exposed, not far from the head of Fall creek, is at an elevation of 1112 feet, but to the south-westward of this point the same bed is found at a lower elevation.

The lower bed, where opened, at the S. E. side of Fall creek, near its head, was measured, and gave the following vertical section—beginning at the top.

1. Sandstone about	-	-	-	-	30 feet.
2. Slate and iron shale,	-	-	-	-	2 „
3. 1st or upper ply of <i>coal</i> ,	-	-	-	-	12½ inches.
4. 1st ply of slate, intermediate,	-	-	-	-	5 „
5. 2d do. <i>coal</i> ,	-	-	-	-	2 „
6. 2d do. slate,	-	-	-	-	4 „
7. 3d do. <i>coal</i> ,	-	-	-	-	9½ „
8. 3d do. slate,	-	-	-	-	1 „
9. 4th do. <i>coal</i> ,	-	-	-	-	4 „
10. 4th do. slate,	-	-	-	-	2 „
11. 5th do. <i>coal</i> ,	-	-	-	-	5½ „
12. 5th do. slate,	-	-	-	-	6 „
Total coal,					33½ „

The last ply of slate rests on a white gritstone, 5 feet in thickness; below which occurs a stratum of gray sandstone; and under that fire clay, four feet thick.

The south-western opening, which has been hitherto supposed to be on the same bed, has exhibited a more unmixed series of coal seams, viz.—

1. Sandstone, as before, about	30 feet.
2. Top slate,	- - 4 feet.
3. Upper <i>coal</i> seam,	- 16 inches.
4. Upper slate,	- - 2 „
5. 2d <i>coal</i> seam,	- 15¾ „
6. 2d slate,	- - 4 „
Total coal,	31¾ „

The coal in this drift is not only less separated into thin plies than in the other opening, supposed to be on the same bed, but is of more uniform texture. The *mining ply*, in this bed, is a stratum of 4 inches of soft slaty matter, 2 inches above the upper seam of coal, constituting part of the 4 feet of *top slate*.

The height of this bed, above our level base, appears to be 1149 feet, or it is 37 feet higher than the opening before described, and the distance from the preceding opening, 1390 feet, in a direction N., $36\frac{1}{2}^{\circ}$ E.

The main cleat or sline of the coal has a direction N., 28° W.

The difference of elevation between these two openings, together with the difference in the plies of slate and coal, may favour the conjecture that they are, in fact, on different beds; and the circumstances are sufficient to warrant some pains to be hereafter taken, to ascertain whether, among the great masses of fallen matter, near the first cascade, or head of Fall creek, and near the level of the bottom of that fall, any traces of the same bed may be discovered.

Should it not be there found, the inference must be admitted, that the lower bed has, in this part of the formation, an inclination of 37 feet towards the N., $36\frac{1}{2}^{\circ}$ E., in a distance of 1390 feet, or about one quarter of a mile. The level of this upper fall is such as to give a degree of probability to the supposition that the coal bed, just described, may yet be found there; for the top of that fall has an elevation of 1148 feet.

The inclination of the measures indicated above, is greater than is believed to be found in other parts of the formation, unless near the very outcropping of the strata. The affirmative determination of this question would add essentially to the value of the mineral ground.

The next series of measurements which I made on the coal beds, was near the old cabin, at the end of Miller's Coal road, and in the eastern opening. The pit sunk at this point, was too near the outcrop to enable me to decide with entire accuracy, all the points in regard to either the thickness or elevation of the seams. The gradual decaying and breaking down of the stratification on the slopes of the mountain, often render the measurements taken at the surface of the ground uncertain; and the uncertainty is the greater as the materials below the coal are more perishable, and easily washed away. The top of this bed appeared to be 1201.6 feet above our base line, and, consequently, 89.6 feet above the level

of the first opening above described, and 52.6 feet above the second.

The series was as follows:—

1. Covering of sandstone, much broken,	4 feet.
2. Iron shale, - - - - -	3 „
3. <i>Coal</i> , - - - - -	32 inches.
4. Slate, - - - - -	15½ „
5. <i>Coal</i> , - - - - -	8½ „
6. Slate, - - - - -	1½ „
7. <i>Coal</i> , - - - - -	13 „
8. Slate, - - - - -	14 „
9. <i>Coal</i> , - - - - -	29 „
Total coal,	82½ „

The lower ply only of coal had here any degree of cohesion, owing to the nearness to the out-crop; but the distinctive character of each seam, both of coal and slate, could be readily discriminated.

The fourth opening, in which measurements were taken, was about 300 feet N., $56\frac{1}{2}^{\circ}$ W., from the preceding, in what has been called Miller's Old Drift, near the cabin, at the end of the coal road. The roof of this opening is 1212.6 feet above our base line, and 10.9 feet above that of the preceding opening. Its covering is iron shale, with some iron ore intermixed; above which is sand rock, as above described.

1. COAL, - - -	32 inches.
2. Slate, - - -	4 „
3. Coal, - - -	19½ „
4. Slate, - - -	7 „
5. Coal, - - -	21 „
Total coal,	72½ „

The above were all the strata exposed in this drift, in a manner to be easily approached or measured.

The main cleat of the upper coal is vertical, and has a bearing N., 30° W.

There is a striking resemblance between the three plies of coal just referred to, and the three principal plies in the preceding section.

Owing, it is believed, to the difference of level between the two openings just described, they have been heretofore supposed to belong to separate beds.

In order to ascertain this point, I caused a pit to be sunk near the mouth of this last drift, to a depth greater than the difference

of level between the roofs of the two openings, but no indications of a second bed were given. As the actual difference of level, thus exposed, was greater than the whole thickness of the bed at either opening, this led me to the conclusion that the two openings are, in fact, on one and the same bed, as indicated by the resemblance between the respective coal seams.

The breaking down of the strata in the former locality, together with some degree of inclination in that direction, may perhaps account for the difference of elevation in these two beds.

I had an opportunity of measuring the thickness of the bed on which Barclay's mines are opened, at a distance of a little more than one and one-third miles, in a direct line, bearing, south 81° west from the old drift just described. I then found the following section, viz:—

Under a covering of sandstone is a roof of nine inches of slate, then,

1. <i>Coal</i> ,	-	-	-	-	-	35 inches.
2. <i>Slate</i> ,	-	-	-	-	-	11 „
3. <i>Coal</i> ,	-	-	-	-	-	6 „
4. <i>Slate</i> ,	-	-	-	-	-	5 „
5. <i>Coal</i> ,	-	-	-	-	-	20 „
6. <i>Slate</i> ,	-	-	-	-	-	3 „
7. <i>Coal</i> ,	-	-	-	-	-	6 „

Total *Coal*, 67 inches, of which 61 inches are worked.

The level of this bed does not lie more than 20 feet above that of the old drift, near Miller's cabin.

It is a well known fact, that where coal and slate seams alternate in the same bed, the relative thicknesses of the several plies of the two materials, may vary very considerably within a few hundred yards. This may suffice to account for all the differences which have been observed in the superior bed of coal in this basin. It would not be safe, however, in a country so little explored, and so much in its primitive condition of a deep forest, to pronounce against the existence of more than the two beds which I have laid down. These are certain, and their existence is sufficient to stamp a value on the region, which it will require a long period to exhaust.

ANALYSIS OF COAL.

Eight samples of the coal of this region have been examined.

No. 1. This specimen is from the fifth ply of coal in the lower

bed, opened near the head of Fall creek. Thickness of the ply, 5½ inches.—Its specific gravity is 1.5155.

At a temp. of 300, it loses of moisture,	-	1.3	per cent.
By distillation at a red heat of water,	-	4.5	„
Uncondensable gaseous matter,	-	9.2	„
It contains of carbon,	-	62.6	„
And of earthy matter,	-	22.4	„
<hr/>			
100.0			

The ashes are almost perfectly white, and of moderate density. This, as well as the two following specimens, are from parts of the bed so near the out crop as to yield, as in all similar cases, a higher proportion of earthy matter than would be found to exist in the coal when not exposed to any of the decomposing influences of the atmosphere.

No. 2. This specimen was from the third ply of coal in the same opening as the preceding.

The thickness of this ply is 9½ inches.

Its specific gravity is 1.4485.

At 260° it loses of moisture,	-	1.9	per cent.
And at a bright red heat it gives of water,	-	6.2	„
„ „ „ of gas,	-	9.3	„
<hr/>			
17.4			
It contains of carbon,	-	70.0	„
And of earthy matter,	-	12.6	„
<hr/>			
100.0			

The ashes are dense, and of a greyish white colour.

No. 3. This sample is from the second ply of the same bed, the thickness of which is two inches.

Its specific gravity is 1.4651.

At 220° it loses of moisture,	-	1.2	per cent.
At redness it is decomposed, giving of water,	-	5.7	„
„ „ „ of gas,	-	12.2	„
It contains of carbon,	-	63.9	„
And of earthy matter,	-	17.	„
<hr/>			
100.0			

The ashes are light, and have a white colour, very slightly inclining to buff.

No. 4. This sample of coal was taken from the old drift of Mil-

ler's opening, north-west of the head of Fall creek, and from the middle coal of that bed, which is $19\frac{1}{2}$ inches thick. Its structure is somewhat irregular, inclining to rhombic, and its colour rusty brown. The surfaces of deposition presenting distinct traces of vegetable fibres in a state of charcoal.

Its specific gravity is 1.3771.

It loses in moisture at 220,	-	-	2.5	per cent.
At a red heat it parts with water,	-	-	3.0	„
And of combustile and other gases,	-	-	15.0	„
It contains of earthy materials,	-	-	11.4	„
And of carbon,	-	-	68.1	„
				<hr/>
				100.0

The ashes of this coal are almost perfectly white, or but very slightly inclining to buff.

No. 5. This specimen is from the lower part of the upper 32 inch ply of coal in Miller's old drift, and possesses a cubical structure, with a specific gravity of 1.3784.

It possesses of hygrometric moisture,	-	1.0	per cent.
Water given out in coking,	-	3.5	„
Gas volatilized by bright red heat,	-	14.7	„
Carbon,	-	65.5	„
Earthy impurity,	-	15.3	„
		<hr/>	
		100.0	

The ashes are moderately light, and of a grey colour, compounded of white and chocolate.

No. 6. This sample was likewise from the upper, or 32 inch ply of coal in the old drift before mentioned. It possessed the cubical structure, and fine deep black colour.

Specific gravity 1.3492.

It contains of moisture, vaporized at 212°,	1.3	per cent.
Of water, tar, &c. disengaged in coking,	6.5	„
Uncondensable gas, - - - -	11.5	„
Carbon, - - - - -	74.97	„
Earthy matter, - - - - -	5.73	„
	<hr/>	
	100.0	

The ashes are of a rather deep chocolate brown, scarcely less marked in this particular than any of the red ashes of anthracite.

No. 7. This coal was obtained from the middle part of the bed, at Mason's mine, on the head waters of Wagner's run. The coal

from this mine is already in the highest repute, both for domestic consumption and for purposes of the arts.

It has a specific gravity of 1.388.

It contains of moisture volatile at 390° , - 0.6 per cent.

No. 8. This coal is from the lower part of Mason's bed; it possesses a columnar structure, the surfaces of deposition being distinctly marked; its colour deep black, surface of vertical fractures shining.

Its specific gravity is 1.400.

IRON ORES.

The argillaceous carbonate of iron is the principal variety to be expected in all coal districts. The Carbon creek formation is found in this respect to sustain the general character of all our Pennsylvania coal fields, yielding ores in considerable variety, and of different degrees of richness, capable of producing from six or eight, to forty or fifty per cent. of metallic iron. These ores have been found either in place in the solid strata, or scattered in rolled pebbly masses, over so much of the property as to leave no doubt of their constituting, originally, regular portions of the formation. Thus I have collected samples from the heads of Fall creek, and from those of Long valley, as well as along the *channel* of the latter tributary; they are also met with in Wagner's Lick creek, and especially on the heads of the latter stream, where the ore has been fully exposed a few hundred yards from Mason's coal mines. Kidney ore is found in several places directly overlying the upper bed of coal.

The lowest stratum of ore which I have been enabled to examine, is situated, as abovementioned, 1016 feet above the level of our base line, such at least is its elevation where opened on Fall creek. It constitutes a bed $37\frac{1}{2}$ inches thick, reposing on a bed of fire clay, 16 inches thick, and covered with a ferruginous shale, 6 inches thick. From this statement, it will appear that the mining of this ore will be effected without any unusual difficulty.

In the solid part of the stratum, where the influences of the weather have not interfered with its natural state, it is of a light blue colour, of irregular texture, being sometimes uniform, and at others, conglomerated of clay, and fragmentary masses of iron ore. The weathered specimens are commonly of a dark brown colour, approaching to black, and are obviously changed from the character of carbonates of the protoxide to hydrated peroxides of the metal. As in passing through this change some portions of

earthy matter are commonly separated and washed away, the ore in this latter condition is richer than in its previous state of a carbonate, the *loss* in carbonic acid and earthy matter being greater than the *gain* in oxygen and water. This remark will also apply to the other carbonates, as compared with the hydrated parts of the balls or blocks of ore. In the process of decomposition the hydrate is often accumulated in the form of a shell, more or less regular upon the exterior of a nucleus of spongy earthy matter, nearly destitute of iron; such shells are occasionally found in the bed now under consideration. The following are the results of my examinations of this ore.

No. 1. A specimen of this ore from near the outcrop was selected, having the elongated kidney form, a shell enclosing white earthy matter, its colour in recent fractures of the shell, dark brown.

Its specific gravity was 3.2264 at a temperature of 56° Fah. It lost at 320° $2\frac{1}{2}$ per cent. in water; and by the application of a white heat for some time, the combined water expelled, amounted to 21.1 per cent.

An assay of this ore in the dry way, without any admixture whatever, gave, of metallic iron, 32.5 per cent., and of earthy cinder, 29.8 per cent.; oxygen, 14.1 per cent.; water, 23.6 per cent.; of which 2.5 per cent., as above stated, was uncombined.

This analysis proves that for each equivalent of iron, in combination (28), there was present $1\frac{1}{2}$ equivalent of oxygen (12), and 2 equivalents of water (18). This corresponds with the constitution of bihydrated peroxide of iron.

The pig metal obtained in this assay was of a light grey colour, and rather brittle. This trial proves that the ore will not actually require the use of any flux for its reduction.

No. 2. This sample was taken from under the fall, below the lower bed of coal, and was in the original state of the mineral not changed to hydrate, as in the preceding example. Its colour is light blue, its texture is amorphous, or foliated, its fracture irregular; some shining particles, probably pyritous, are distributed through it.

Its specific gravity is 3.0549. At 320° it loses 0.5 per cent. It loses when heated to whiteness, 10.5 per cent. of carbonic acid, with probably a little sulphur. The amount of iron contained in this ore, was 24.2 per cent.; of earthy materials, 49.2. The state in which the iron exists in this ore is doubtless that of a proto-carbonate. The cinder was brittle, of a green colour, and perfectly fused.

No. 3. This ore was taken from the fifth ply of a bed about 10 feet in thickness, and at an elevation of 1080 feet above our base line, and 64 feet above the $37\frac{1}{2}$ inch bed already described. The ply is 18 inches thick.

This ore has a brown or ochrey appearance, and being taken from a point at no great distance from the outcrop, has evidently undergone a change from atmospheric influences. Its fracture is uneven, and its texture analogous to some of the argillaceous shales. Its specific gravity is 2.7256. It contains of hygrometric moisture, vaporizable at 320° Fah. 2 per cent.; of water in combination, 4.8 per cent.; metallic iron, 44 per cent; earthy matter, 24.3.

The remaining 4 portions of the 10 feet bed, from which the preceding sample was taken, were examined, and found to yield different quantities of iron, from 6 to 16 or 20 per cent. It is probable that in working some of the other varieties of ore found on the Company's domain, portions of this 10 feet bed will be found available as furnishing materials to promote the fusion and facilitate the working of the richer descriptions, which do not contain a sufficient quantity of earthy ingredients to produce a good cinder for the protection of the iron in the hearth.

No. 4. This sample is from a stratum of iron ore and fire clay found on Fall creek, at an elevation of about 18 feet below the lower bed of coal, or 1092 feet above our base line; the bed of materials in which it occurs, is 2 feet 6 inches thick, of which 4 inches at the bottom are fire clay, the remaining portion iron shale, intermixed with flattened reniform masses of argillaceous carbonate of iron, and some carbonaceous matter derived from fossil vegetable remains. The whole bed, together with the superincumbent mass of coarse sandstone rock, or fine conglomerate, appears to have fallen from place, and the situation was not therefore favourable for determining the real value of the bed. The sample submitted to experiment, was a fair type of the ore in this bed; but it should be added, that all which we could conveniently obtain at this place, had undergone a change, and been reduced from carbonate to hydrate.

Its specific gravity was found to be 3.2113.

It lost of hygrometric moisture,	-	-	3.5 per cent.
Of combined water expelled by a full red heat,	12.7	„	
Pig metal,	-	-	53.4 „
Earthy matter,	-	-	5.8 „
Oxygen,	-	-	24.6 „

100.0

The pig metal is of good quality, soft, gray, and tough. The cinder was imperfectly fused, but with 20 per cent. of lime, would probably be fully reduced.

In the assaying of other parts of this band of 10 feet of argillaceous ore, a friable, semivitreous cinder was obtained by the use of about one-twentieth its weight of carbonate of lime; but the large quantity of earthy matter in the ore, would demand in practice, considerable increase of that quantity, probably to the extent above named.

No. 5. This ore was discovered on the head waters of Long Valley creek, in a decayed and broken down portion of the measures, in such a situation as induces me to believe that its original place in the formation is near the level of the lower bed of coal, probably a little above it. Its colour is brown, externally, and yellowish within; it is evidently a hydrate, formed by the decomposition of carbonate.

Its specific gravity is 3.3604.

It lost of water, by heating to 320° , - 3.8 per cent.

And at a white heat, - - - - 14.1 „

Of pig iron, it gave - - - - 48.4 „

Earthy matter, - - - - 3.9 „

The pig metal was grey, tough, and moderately soft; the cinder opaque, greyish white. In this assay, the cinder was rather imperfectly reduced, and some portions were probably lost.

No. 6. This specimen of ore was taken from a pit sunk about 8 feet deep, near Mason's coal mines, on the head waters of Wagner's run; the band of flattened balls, very closely compacted together, is 6 inches. This band of ore is found near the northeasterly outcrop of the series of coal measures, a few feet only above the level of the heavy stratum of conglomerate rock, which marks so distinctly the limit of the basin in that direction. Its place is indicated on the section across Carbon creek, below Wagner's run, accompanying this Report; and which is intended to exhibit, on its right hand portion, the northerly outcrop of the measures, as well as the central portion south-east of the Carbon. In this same locality, are exposed three other strata of ore, the first of which is $5\frac{1}{2}$ feet above the one now under consideration, the second $6\frac{2}{3}$ feet, and the third about $7\frac{1}{2}$ feet. This last is a band of balls, as will be more particularly stated below; hence, it will be seen, that all four of these bands of ore may be worked together, within a vertical height of 8 feet. The total thickness of the 4 bands being about 18 or 19 inches, and the intervening matter to

be mined out, ferruginous slate and other friable sandstone, will not, I apprehend, present any serious difficulties in the mining.

The following section shows the whole of these measures, commencing at the top:

1. <i>Balls of iron ore,</i>	-	-	-	-	0 feet 3 inches.
2. Slaty sandstone,	-	-	-	-	0 „ 9 „
3. Upper <i>band of iron ore,</i>	-	-	-	-	0 „ 6 „
4. Siliceous iron shale,	-	-	-	-	1 „ 0 „
5. Middle band of <i>kidney ore,</i>	-	-	-	-	0 „ 5 „
6. Ferruginous slate,	-	-	-	-	5 „ 0 „
7. Lower band of compact <i>balls of iron ore,</i>	-	-	-	-	0 „ 6 „
8. Iron shale,	-	-	-	-	1 „ 6 „
9. Black slate,	-	-	-	-	0 „ 6 „
10. Iron shale,	-	-	-	-	1 „ 8 „

The four varieties of ore found at the above locality, are also met with in various other situations on the property, especially on Long Valley creek, in the bed of which, samples exactly similar to the lower band of the above section, have been observed in numerous places. This band is of a durable texture, and appears to resist more firmly than the accompanying materials, the decomposing action of the atmosphere, and hence it continues unaltered in places where all the others have been washed away. The specific gravity of this lower band is 3.265.

It loses by calcination,	-	-	-	-	22.7 per cent.
And gives of iron,	-	-	-	-	29.4 „
Earthy matter,	-	-	-	-	36.7 „
Volatile matter, oxygen, &c.	-	-	-	-	11.2 „
					<hr/>
					100.0

No. 7. This is the middle ply of the ore in the bed near Mason's coal mines. It is found in a stratum of kidney shaped balls, 5 inches thick. Its colour, in fresh fractures, is dark bluish gray, surface splintery, occasionally giving conchoidal fractures, compact, and of uniform texture.

Its specific gravity is 3.763.

Heated to 320° it loses but	-	-	-	-	0.2 per cent.
Fully calcined, it loses in addition,	-	-	-	-	29.8 „
Treated with pure lime; it yields at once					
malleable iron with a little oxide,	-	-	-	-	45. „
Earthy impurity,	-	-	-	-	4.1 „
Oxygen,	-	-	-	-	10.9 „

This stratum affords the richest ore which has fallen under my

notice from any coal formation, for the sample above analyzed was not a surface specimen reduced to the state of a hydrate, but a well marked solid carbonate, with only a thin surface coating of hydrate. It will probably be found expedient to work it with either No. 1 or No. 3, or with both together, in order to obtain a good soft pig metal.

No. 8. This ore is found in the upper band of the three already mentioned as occurring together in Mason's bed. It generally presents the appearance of nearly square blocks, or brick shaped masses, 7 inches thick. Above this ply of ore, is a course of balls separated from it only by a few inches of friable sandstone, a coarse quartzose grit lies a little higher. The aspect of this ore, when it has not undergone any decomposition by atmospheric influences, is a dark gray colour, a rather rough surface, and a mixture of shining metallic particles interspersed through the body of the ore, as well as on its surface.

Its specific gravity is 3.4783.

At 320° it loses,	-	-	-	-	0.4 per cent.
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At white heat it undergoes decomposition,					
and loses,	-	-	-	-	25.8 „

It smelts without difficulty, and yields of					
pig iron,	-	-	-	-	43.3 „

It contains of earthy impurities, fusing					
into a dirty white cinder,	-	-	-	-	25.4 „

And the oxygen is,	-	-	-	-	5.1 „
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100.0

The pig metal obtained was soft, gray and tough. There is no doubt in my mind, that this ore will be found to work well either by itself or with the other ores found in this bed.

No. 9. This specimen was from the stratum of balls, three inches thick, in the abovementioned opening, not far from Mason's coal mines.

Its colour is yellowish, or dark brown. Its specific gravity is 3.4977.

At 320° it loses,	-	-	-	-	0.5 per cent.
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Calcined to whiteness it loses in addition,					25.5 „
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And when smelted, yields of pig metal,					45.6 „
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Of earthy impurities it contains,	-	-	-	-	10.7 „
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And of oxygen,	-	-	-	-	17.7 „
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100.0

The iron is moderately tough, and of a light colour, appearing rather less favourable for foundry purposes than the results of the other plies in the same bed.

No. 10. This specimen, as well as the next, was found on Wagner's run, the precise elevation not ascertained. It appears in many respects analogous to the ore in the $37\frac{1}{2}$ inch bed on Fall creek, being a conglomerate of pebbly masses of clay ironstone, with a cement of earthy and ferruginous matter.

Its specific gravity is 2.823.

It contains of water, - - - - 9.2 per cent.

It yields of pig metal, - - - 29.8 „

It contains of earthy impurities, - - 50. „

Oxygen, - - - - 11. „

100.0

No. 11. This specimen, as well as the preceding, was found in the channel of Wagner's run, but as there can be no doubt of its having belonged to a regular stratum of ore not yet explored, but of considerable thickness, it was deemed expedient to examine its properties.

Its specific gravity is 3.5065.

It yields 50 per cent. of pig metal, soft, gray and tough. It resembles strongly the ores found in the bed of Long Valley creek, in some parts in large quantities, and also has a striking similarity to the upper ply in Mason's ore pit. It contains but 8 per cent. of matter insoluble in acids.

From the foregoing details, it will be observed that the yield of the several ores is as follows, viz.—

No. 1.	-	-	32.5
2.	-	-	24.2
3.	-	-	44.0
4.	-	-	53.4
5.	-	-	48.4
6.	-	-	29.4
7.	-	-	45.0
8.	-	-	43.3
9.	-	-	45.6
10.	-	-	29.8
11.	-	-	50.0 mean 40.5 per cent.

FIRE CLAY.

At least three strata of fire clay have been observed on the waters of Fall creek; one 16 inches thick, under the 37½ inch bed of iron ore; one 4 feet thick, above the 10 feet bed of ore and iron shale; and another still higher, accompanying a bed of ore under the coarse gritstone or conglomerate. This clay, of the 4 feet bed, has a dark gray colour, compact structure, and possesses a specific gravity of 2.646. In the fire it becomes reddish white, but is otherwise unchanged except by cracking, as it shrinks, and displaying on the exterior some traces of oxide of iron.

LIMESTONE.

This material has not yet been found in place in any considerable quantities on the property of the Company, but in several of the denuded valleys it occurs in such quantities as to leave no doubt of its constituting a regular part of the formation. It was observed not only in the bed of Carbon creek, but also in that of the Long valley, Fall creek, and some other tributaries. It is of the gray fossiliferous variety, and belongs in the strata below the coal. The fact of having noticed some of it not far from the great falls of Fall creek, has induced me to believe that it must be found in place within a moderate distance of the bottom of those falls.

A sample of the limestone picked up in the channel of Long Valley creek, possesses a specific gravity of 2.7054.

It contains about 40 per cent. carbonate of lime.

„	3.5	„	peroxide of iron.
„	56.5	„	argillaceous matter.

100.0

This limestone will probably be found sufficiently pure to serve as a flux for any of the ores contained on the Company's property.

As the valley of the Towanda creek, below its junction with the Carbon creek, presents many localities where fossiliferous limestone of lower strata than that above described, are brought into view, it was deemed proper to make also some trials to determine its degree of purity: its colour is reddish gray.

Its specific gravity is 2.658.

It yielded of carbonate of lime,	-	-	-	45.5 per cent.
„ peroxide of iron,	-	-	-	5.5 „
„ earthy argillaceous matter and sand,				49.0 „
				<hr/>
				100.0

A limestone of this variety has been heretofore employed in the manufacture of lime for building, near Munroeton. It would in all probability serve the purpose of a flux, should the quantity on the lands of the Company be found inadequate, and being immediately on the line of the road, would be easily procured in sufficient quantity for that purpose.

WATER POWER.

The amount of water power furnished by the Carbon creek, is a very important item in the advantages of this property, and will enable the Company to employ not only the vast quantity of growing timber for the manufacture of lumber, but also to manufacture iron or other materials for which this species of power may be found desirable.

The distance from the eastern line of the property which I have examined, where that line is crossed by the Carbon creek, to the western line where the creek survey terminated, is, by the course of the creek, a little more than six miles, and the fall in that distance is 304 feet, or almost precisely 50 feet per mile, for the whole of that distance. Situations favourable for the location of mills are to be found throughout the whole of this distance, and the quantity of water furnished by the creek during the whole of the driest part of the past summer and autumn, was such as to warrant the belief that the body of water, as well as the amount of fall, is ample for every purpose of mechanical power. Though the stream is liable to considerable and rather rapid increase within a few hours, yet sites may, in every instance, be selected for the mills, where they may be completely defended from inundation, and capable of availing themselves of every stage of water for profitable operation.

By erecting a dam across the Carbon creek, about 4 or 5 feet in height, near the head of the line of rapids commonly known as the Great Falls, it will be practicable, by a raceway of not more than 1300 feet long, to appropriate the entire stream to manufacturing purposes, with a fall of not less than 28 feet perpendicular distance. I would therefore recommend the early erection at this place of a mill, with an overshot, or pitch back wheel, with at least four runs of saws, and with all the latest improvements in the machinery of such establishments, including a double track of railway to bring the logs immediately to the saw carriages, and to remove the lumber when produced, immediately to the main track of the Company's rail road, where it will at once be put on

its way to a market, instead of accumulating about the establishment. As subservient to the establishment of a mill, such as I have now suggested, the erection of a small saw mill, on the ordinary plan, will be expedient, and this can be established at the Little Falls, a few hundred yards below the point just designated for the larger establishment. Such a mill would be at all times profitably occupied in furnishing lumber, either for the supply of the works, or for the market.

TIMBER.

Immediately connected with the subject of water power, is that of *timber*, of which the Company's property contains an abundant supply. Pine is perhaps the most valuable variety, whether we take into view the great and increasing demand for that article, or the great size and value of the trees. This variety is chiefly confined to the higher table lands, or mountain summits, where they attain a diameter of three or four feet, and a proportionate altitude. On the north-western portion of the property, some part of the pine timber was sold by a former owner of the land, but on other parts much fine white pine timber yet remains.

Hemlock is probably the most abundant growth of trees, and will supply an immense amount of lumber. As this timber is rapidly rising in importance in proportion as pine becomes scarce throughout the country, it will be found that the forests of it which now load many parts of the Company's property, will be a most interesting and available source of revenue.

In order to form an approximate estimate of the value, amount, variety, and proportion of the timbers growing along the Carbon creek, I caused a portion of ground taken at random in the midst of the forest, to be measured, and the girth of each tree to be separately ascertained, together with an estimate, by an experienced woodsman, of the number of saw logs, of 16 feet in length, which each could furnish, judging from its height and apparent condition. The result was, that the acre contained 64 hemlocks fit to be converted into lumber, yielding 162 logs fit for the mill, each 18 inches in diameter, on an average, and 16 feet in length; giving at least 160 feet board measure of lumber, or the acre would produce 27.520 feet. There were also found 12 beeches, each giving a log, averaging eight inches in diameter, and eight basswood trees, each yielding one log of the usual length, and one foot in diameter.

On some parts of the property, it is true, much less timber would

be found than on the spot above referred to; but it is equally true, that on other portions much more would be obtained, and of more valuable varieties. Pines of gigantic growth are found on several portions of the tract, and cherry, maple, birch, sugar, whitewood, chestnut, sycamore, ironwood, and some oak, are found to prevail according to situation. The pine is found mostly on the high table land, upon the coal measures. Cherry trees of great value, being two and three feet in diameter, were observed about the head waters of Mason's and Newbold's runs, on the south side of the Carbon creek. A single tree of this kind would purchase, if placed on the banks of the Susquehanna at Towanda, many acres of land, at the prices which have been paid for it in situations not less favourable than that on which these cherries are now growing. The only desideratum is the rail road for the easy transportation of lumber, and the mill to prepare it for market.

But without estimating these valuable varieties, if we confine our attention to the timber alone, which is certainly the prevailing species, we shall find that at the estimate of quantity above given, and at a profit of no more than two dollars per thousand, above all expenses, the timber would yield fifty-five dollars per acre.

There has been some devastation by fires, particularly on the high ridge between the heads of Wagner's lick, and Long Valley creek; but on the whole, I consider the quantity of burnt land rather unusually small, as compared with most other parts of our Pennsylvania mountain country, which I have heretofore traversed.

Besides the vast amount of standing timber, there is in certain situations a large quantity of that which has been prostrated by tornadoes, &c., which an economical management would convert to profitable purposes. It might even be a question whether it would not be better, in the commencement of iron manufactures, to employ the fuel which is so superabundant above ground, rather than seek it beneath the surface. It is impossible to estimate the hundreds of thousands of cords of timber, now annually consumed in clearing land in Bradford county. The Company would probably find in their iron ores, a material on which all this useless waste would be most happily saved, while all the bituminous coal, which they might be able to mine, would find a ready and profitable market.

RAIL ROAD.

The borough of Towanda, situated between one and two miles above the mouth of the Towanda creek, and on the western side of the north branch of the Susquehanna river, was made the point of departure of my surveys and levellings; and the point selected for the first station was on the western guard bank of the dam at that borough. The level of that bank is consequently assumed as the base line for all the altitudes taken during the survey. That level is eight-tenths of a foot above the level of the wall of the abutment where it faces the chute, and 11.413 feet above a bench on a willow tree north of the guard bank, from which the *measurements* were commenced.

The line commenced at this point was carried on a level for about 2 miles 864 feet, along the margin of the slope of very gentle acclivity, and just upon the border of the meadow grounds which occupy the whole space between our line and the Towanda creek. The direction for the first 3000 feet varies but very little from due south, but tending slightly to the west; it afterwards inclines gradually to the west, as the slope of ground sweeps away in that direction.

The surface of this declivity is such as to allow of locating the road on any angle of inclination which may be judged desirable; and the nature of the soil is entirely favourable for grading.

The slope towards the level meadow is in angles, varying from 5 or 6 to 15 or 20 degrees, and consequently will offer no serious obstacles to the execution of the work.

At the end of the level section, the experimental line was found to be 2300 feet from the Towanda creek. From this point it was traced on a moderate ascent for 2000 feet, until it reached the road leading from Towanda to Munroeton, where the latter passes the house of G. Bowman; and where the elevation attained was $33\frac{8}{10}$ feet above the level of the base line. From this point to the village of Munroeton the distance is 1 mile 3320 feet; and the elevation attained at Johnson's tavern, in the centre of the village, was found to be $71\frac{215}{1000}$ feet above our base line. The whole distance is 4 miles and 904 feet.

From the last named point the line was carried to the Towanda creek, where it is crossed by the bridge on the Berwick turnpike; and the water level, at that point, was ascertained to be $58\frac{648}{1000}$ feet above the base line. Distance, 1149 feet.

The slope of ground on the right of the line, thus far traced, is

such as to allow of locating a rail road on a nearly regular grade, from Towanda to the centre of Munroeton; or may, by keeping about 60 rods to the right, or northward of the latter village, be elevated some distance above its level, in case it should be deemed advisable, as seems most probable, to construct this part of the road on a grade of considerable elevation.

From the Berwick turnpike bridge, the line of survey passes along the road leading to Mason's bridge, a distance of 4930 feet, and on a bench, level with the floor, and near the eastern extremity of the bridge, the elevation above the base line was found to be 99.3 feet, or ascending at the rate of twenty feet to the mile for the whole distance from Towanda.

From Mason's bridge two lines were surveyed. The first following the course of the road going up Towanda creek to Lewis' tavern; thence, following the road leading to Mason & Co's mines, to a point marked Station 78, nearly on the highest point of land attained by said road, before reaching Northrop's settlement.

The other line commences on the bluff of land east of Mason's bridge, at an elevation of 74.561 feet above the bench before mentioned; and, consequently, 173.861 feet above the level of Towanda, and crossing the Towanda creek at an elevation of 88.4 feet above low water, pursues a nearly direct course, or curving very gradually, for 1 mile and 393 feet in a direction between south-west and due west, tending gradually more and more to the latter, till it reaches the eastern slope of the valley of Carbon creek; thence, curving pretty rapidly to the south, follows afterwards for 2200 feet, a nearly straight course, till it joins the first mentioned line at Station 78. Of this section of 1 mile and 2593 feet, the whole, except 1883 feet at the commencement, may be level. On that first portion, the grade will be at the rate of 43.3 feet per mile.

To join the eastern end of this line on the bluff near Mason's bridge with Towanda, the mean grade between these two latter points would be 37.8 feet per mile.

From Station 78, the elevation of which is 189.334 feet, the line actually traced, followed the direction of the coal road towards Mason's bed, descending into the valley of Carbon creek, near the widow Northrop's, where it has an elevation at Station 80, of 152.374 feet, and continued along or near the road, till the Millstone run was reached.

It has not been contemplated to follow exactly this route in locating the road, but to continue at or near the level of Station 78,

and to follow the *slope* of the valley to the left of the coal road, so as to preserve in this, as in all other parts of the line, either a level or a descending grade, from the coal deposits towards the river Susquehanna.

From Station 78 to Station 89, at Millstone run, the distance is 6550 feet, and the ascent will be $19\frac{796}{1000}$ feet. The point of crossing is proposed to be about 350 feet higher up stream than the bridge on the coal road.

From Station 89, over the Millstone, to Station 99, near the bridge on Mason's road over the Carbon creek, the distance is 5575 feet, and the ascent, in that distance, $19\frac{819}{1000}$ feet.

The bridge, at this point, is proposed to be placed a little higher up the stream than the present road bridge, and from this point to "the falls," and even to Elk lick, the location ought to be entirely on the western side of the Carbon.

From Station 99, the line first levelled followed the coal road only 200 feet farther, when it diverged to the left, going up the creek to Station 106, where it crossed to Cox's clearing; thence to Station 113, where it again crossed to Ryder's old clearing; and thence on the same side of the stream, to Station 204, above Elk lick. At 138 the line first reaches the Company's lands. At 145 it comes to Wagner's Lick creek. The whole distance from Station 99 to Station 145, is 9407 feet, or one mile and 4127 feet, and the ascent in this distance is $83\frac{383}{1000}$ feet, or at the average rate of 46.8 feet to the mile. For the last half mile, however, the grade is at the rate of $56\frac{1}{2}$ feet to the mile. This comes to the point from which the coal and iron deposits of the Company may be reached in a horizontal distance of 5900 feet, or $1\frac{1}{7}$ miles; but the course to be pursued will be necessarily somewhat longer, and the route will be traversed on self-acting inclined planes, overcoming an elevation of 907 feet. As the minerals, both of coal and iron ore are already opened at this point, and as the quality of the materials already taken from Mason & Co's mines, is well established, it would in all probability be expedient to commence an approach to the minerals from this point, rather than carry the road higher up the Carbon creek. For the purpose of prosecuting the operations in lumber, it would be advisable to extend the rail road at least as far as the falls, and the distance beyond Wagner's Lick creek to that point, is 3300 feet, and the ascent $32\frac{29}{100}$ feet, or at the rate of a little more than 51 feet to the mile. Along the bottom lands from Station 145 to Station 160, near the falls, the road formation will be of easy execu-

tion, and in no part of the distance already referred to, can it be considered difficult, as the excavations, where such may be found necessary, will be in the immediate neighbourhood of points where the materials excavated will be required for embankment. The route surveyed above the falls, continues in part on the bottom lands and in part on the slope of the north-westerly side of the Carbon creek, ascending with the course of the stream to Elk lick, at Station 196, at which the distance above the falls is one mile and 2110 feet, and the total ascent $64\frac{117}{1000}$ feet, giving an average of 44.4 feet per mile.

From this point to the mouth of Fall creek, the survey was partly on the right, and partly on the left bank of the Carbon creek, and in carrying a rail road above Elk Lick, I should propose to cross occasionally the channel of the stream, to avoid steep slopes, which approach the margin of the stream on both sides successively.

The distance from the camp at Elk Lick to the mouth of Fall creek, is 7090 feet, and the elevation overcome $73\frac{8}{100}$ feet, or at the rate of 54.2 feet to the mile.

From Station 234, the mouth of Fall creek, to the termination of the Carbon creek levellings, 1600 feet above the Big Eddy, the distance is 12,420 feet, or 2 miles and 1870 feet; and the total ascent 108.426 feet, or at the rate of $46\frac{5}{100}$ feet per mile.

The above details will be rendered intelligible by reference to the accompanying map, and particularly by an examination of the large sectional map, drawn to a scale of 200 feet per inch, which is herewith placed in the hands of the directors.

From the foregoing statements it will be seen, that the following table of distances, elevations, and grades, may be taken in locating the rail road from the Towanda dam to the upper line of the Company's property; the variation from the line actually traced in my survey will be such as occasionally to augment the distance from point to point, and occasionally to diminish that between other points referred to.

TABLE.

Points on the line of Survey from Towanda up Carbon creek.	Distance in ft. from the abutment of Towanda Dam.	Distance in miles from the Towanda dam.	Partial distances in miles from point to	Total height above Towanda.	Partial heights of the respective points.	Average grade per mile on each division.
From Towanda to Point hill, east of Mason's bridge, at the crossing of Towanda creek.	24,300	4.60	4.60	173.861	173.861	feet. 37.79
To Station 78 on the slope of the valley of Carbon creek.	32,143	6.09	1.49	189.334	15.473	10.38
To bridge across Millstone run.	38,693	7.33	1.24	209.130	19.796	15.96
To bridge across Carbon creek above Henry Northrop's, Station 99.	44,268	8.38	1.05	228.949	19.819	18.88
To mouth of Wagner's Lick creek, foot of Inclined Plane, to reach coal beds.	53,675	10.17	1.79	312.332	83.383	46.6
To the falls of Carbon creek, proposed site of Mills.	57,075	10.81	0.64	344.622	32.290	50.45
To Elk Lick Station 196.	64,465	12.21	1.40	408.739	64.117	45.8
To mouth of Fall creek Station 234.	71,560	13.54	1.33	481.821	73.092	54.95
To Station 243, and bench above Big Eddy.	83,980	15.90	2.36	590.247	108.426	45.94

From the foregoing table it will be seen, that a rail road to be traversed by locomotives, and of little more than *ten* miles in length, will reach an eligible site for receiving the coal and other minerals contained in the beds now worked on the northerly side of the Carbon creek. From that site, which is $312\frac{1}{2}$ feet above Towanda, the mineral beds will be reached by means of a succession of self-acting inclined planes, overcoming an elevation of about 907 feet, for the highest portions of the coal formation, and about 750 feet, to the lower bed of coal, iron ore, &c. The position above designated, will enable the Company to approach

their mineral deposits on the south-eastern side of the Carbon creek, as well as on the north-western. The direct horizontal distance to either of the abovementioned coal deposits, does not much exceed one mile from the mouth of Wagner's Lick creek. The valley of this creek will afford the means of connecting the rail road at its mouth, not only with that part of the mineral beds which is commonly known as Mason's mines, but also with an extensive bed lying westwardly of these, between the heads of Wagner's run and Long Valley creeks.

Should the route from Mason's bridge westward, to which I have given the preference, be adopted, it may be found for the interest of the Company, as well as of the citizens of Munroeton, to construct a branch which will not require to be more than sixty or eighty rods in length, to connect that village directly with the general line on the north. And though upon the grade above recommended for this part of the road, it will lie some feet above the level of the village, yet as such branch would be mostly traversed by horse power, it would present no serious obstacle to profitable use. If a high grade be found expedient, it will be no higher than is often adopted in the neighbourhood of mines, and through the streets of our cities.

The accompanying profile of the main line of rail road will show that its grade is much lower than that of several roads in our country, which have both an ascending and a descending trade; while here the whole trade being in the descending direction, the empty trains only will have to be drawn upward on grades not elsewhere deemed incompatible with the ascent of loaded trains. Scarcely any power but that of gravitation will be required to propel the loaded trains from the mines to the Susquehanna.

BRIDGES.

The principal bridges required on the rail road, will be three; one over the Towanda creek, 700 or 800 feet long; one over the Millstone run, about 75 feet long; and one over the Carbon creek, about 150 feet in length. A number of small tributaries and ravines will require either culverts or bridges of inferior dimensions, and the amount of bridge work may be varied as the comparative expensiveness of embankment and of bridge-making in the particular situation shall be found to give a preference to the one or the other construction. The great abundance of *timber*, which must be removed to give place to the Company's establishments, will no doubt favour the use of bridges wherever

they can be advantageously substituted, for fillings in the ravines which occasionally cross the route of the rail road. The mills about to be erected, will enable the Company to prepare their bridge timber at the most reasonable rates, and by commencing the road on the upper sections near the falls of Carbon creek, the road itself will greatly facilitate the construction of its own bridges, by the easy transportation of their materials.

As the foregoing surveys were altogether experimental, and as no actual locations were required, I did not enter into such details in regard to the amount of cutting and embankment, or the number and size of culverts, which may be found necessary, as would enable me to estimate with precision, the expense of constructing each part of the road.

In regard to the value of land for which damages may be claimed, I may remark that the location which I have contemplated, especially between the Susquehanna river and Mason's bridge, is such as to avoid the valuable meadow lands, and adhere to the edge of the slope, on which neither at present, nor probably at any future time, could a high value be placed. While this will relieve proprietors of all apprehension on the score of injury to their fields, gardens and buildings, it will relieve the Company from a considerable item of expense, to which they might otherwise be liable. A similar remark may be applied to the route proposed to be followed between Mason's bridge and the Millstone run, on the whole of which distance the road can be located on ground almost altogether valueless for agricultural purposes, while at the same time it is greatly preferable to any other route for the road in question.

Beyond the Millstone run, it is confidently believed, that all the land over which the road will pass, will be absolutely benefited by its construction, as it will afford the proprietors an opportunity of forwarding, by an easy transportation, the products of their land to a highly eligible market. I cannot conceive that damage to the amount of 1000 dollars should be done to all the lands over which I propose to locate the road, between Towanda and the Company's own property, on the Carbon creek. On the contrary, I feel assured that if every proprietor on the line were to release, unconditionally, all claims for damages, he would, from the increased value of property, consequent on the establishment of extensive coal and iron works in his vicinity, be greatly benefited by the transaction.

In laying out the road, it will, perhaps, be advisable to appro-

priate the usual amount of land required for a double track road; but I would not recommend, at present, the construction of more than a single track, except at short sections, for the passing and repassing of trains, for which operation arrangements can always be so made as to avoid interference.

Simultaneously with the commencement of operations at the upper section of the road, it may be well to begin the embankment and bridge masonry over the Towanda creek.

In endeavouring to give an approximate estimate of the cost of constructing a rail road, I have taken into view the circumstances abovementioned, and the route designated in the preceding remarks. It will be understood, that it is contemplated to make, in all parts, a plain but durable structure, and that useless or fanciful appendages will be avoided, as equally incompatible with the situation and purposes of the road, and with the interests of the Company.

The self-acting inclined planes, to connect the western extremity of the main line of road with the mineral ground, can be constructed at as little expense, as in any situation where similar works have been undertaken, and they will, doubtless, be found as effective and economical, as any species of power which could be employed on an equal length of horizontal road. A great difference is found between inclined planes which are *self-acting*, and those which require the maintenance of a costly stationary power for their operation.

By computing the probable amount of excavation and embankment, where little or no hauling will be required, but only the work of common labourers, at $12\frac{1}{2}$ cents per cubic yard, I find it will amount to - - - - - \$7,940 98

Excavation and embankment, with hauling, from 100 to 600 yards, at 16 cents, - - - - - 12,902 96

The bridge masonry, at \$2 50 per perch, will probably not fall much short of - - - - - 6,650 00

Bridge superstructure, allowing the timber to be taken from the Company's property, and prepared at their mills, computed at \$10 per lineal foot of bridge, may cost - - - - - 10,250 00

11.83 miles of edge rails, required for a single track road and turnouts, at 50lbs. to the yard, 743 tons, at 70 dollars per ton, - - - - - 52,010 00

\$89,753 94

As the timber for the superstructure may be all procured immediately on the line, the cost of this item will be very low; and should the Company determine on the adoption of a flat rail, similar to that of the Williamsport and Elmira Rail Road, viz. $2\frac{1}{2}$ inches wide, by $\frac{3}{4}$ of an inch thick, the weight will be reduced from 40 to 17lbs. per yard, and the expense for iron, from \$52,010, to \$22,104. As experience has demonstrated the error committed in the early stages of our rail road operations, in laying down inadequate flat bars on wooden rails, causing great expense and inconvenience, I would not recommend one of less weight than that just named. This deduction brings the cost of the above items down to

- - - - -	\$59,848
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The cost of engineering, the labour of laying the superstructure, with the materials for the same, and that of fencing, and miscellaneous items, may amount to	-	20,000
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Making,	- - - -	\$79,848
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From all the preceding statements and representations, I need hardly add the expression of my conviction that the value and resources of the Company's domain are such, as to warrant the prosecution to immediate usefulness of the works required to bring these resources to their appropriate market. The increased hazard in other species of investment, must, I am persuaded, ere long, turn the attention, and the capital of our enterprising citizens, towards those objects, in regard to which, fluctuations are less frequent and disastrous than in many of those branches of business in which so large a portion of capital has hitherto been absorbed, and so much loss and disappointment incurred. Yours will be the employment of a most useful species of our national industry, for the supply of an ample demand in the immediate neighbourhood of your own works.

I remain, gentlemen,

Very respectfully,

Your obedient servant,

WALTER R. JOHNSON.

Philadelphia, March, 1840.

ADDENDA.

The foregoing pages were mostly struck off before the proofs had been submitted to the inspection of the writer, and a few of the analyses, not quite completed when the Report was first submitted, but which were to have been added on reading the first proof, appear incomplete; this is particularly the case with the coals, Nos. 7 and 8. They are added below.

Result of assay of coal, No. 7, (page 12.)

Matter volatile at 390°,	-	-	-	0.6 per cent.
Vapours condensable,	-	-	-	2.8 „
Uncondensable gaseous matter,	-	-	-	15.4 „
Carbon,	-	-	-	68.1 „
Earthy matter,	-	-	-	13.1 „
				100.0

The ashes of this coal are white, slightly inclining to buff, moderately bulky.

Results of assay of coal, No. 8, (page 13.)

Water lost at 340°,	-	-	-	2.1 per cent.
Volatile matter expelled in coking,	-	-	-	16.8 „
Carbon,	-	-	-	68.57 „
Earthy matter,	-	-	-	12.53 „
				100.00

The ashes of this coal are of a white colour, rather inclining to gray, and not remarkably heavy.

Experiments to detect the presence of sulphur succeeded in giving faint traces of that ingredient.

From all the analyses of coal detailed in this Report, we have the following table of general results.

No.	Carbon.	Volatile matter.	Earthy matter.
1	62.6	15.0	22.4
2	70.0	17.4	12.6
3	63.9	19.1	17.0
4	68.1	20.5	11.4
5	65.5	19.2	15.3
6	74.97	19.3	5.73
7	69.0	17.9	13.1
8	68.57	18.9	12.53
	<hr/>	<hr/>	<hr/>
Mean	67.83	18.41	13.76

Thus it appears that the quantity of volatile matter in this coal, is small compared with that of most other bituminous coals of our country. Being situated on the eastern extremity of the first principal range of bituminous coal formations west of the Susquehanna river, it adds another to the many evidences which have been derived from my own experiments in proof of the position long since advanced, that the quantity of volatile matter in the coals of Pennsylvania, and other states, gradually increases as we advance from the Atlantic region across and beyond the Allegheny mountain, over the great coal fields of the western and north-western states.

This law becomes the more striking when the anthracite fields are embraced with the bituminous, for there we have a series commencing almost at zero, and proceeding upwards in the scale of volatility, till, in some of the coals of Kentucky, Illinois, &c., it attains a maximum of 48 or 50 per cent. The circumstance of possessing but a moderate share of bituminousness, is favourable to the application of the coals of this region to the purposes of iron manufacture, and though the per centage of earthy matter is higher than that of some other coals, yet it will be recollected that nearly all the samples are taken from points near the outcrop of the respective beds, and that consequently the relative proportion of earthy matter is likely to be higher than would result from the coals taken a few hundred feet from the edge of the same beds.

ERRATA.

At page 7, line 12, for "lower" read *higher*.

At page 10, line 9, for "beds" read *localities*.

At page 15, line 22, for "18 feet below" read $46\frac{3}{4}$ feet above.

At page 15, line 23, for "1092" read 1158.

At page 17, line 1, for "other" read *rather*.

APPENDIX.

Extract from the Report of the Canal Commissioners of Pennsylvania, Messrs. James Clark, Edward B. Hubley, and William F. Packer, for 1839.

“The design of the Legislature in authorizing the extension of the North Branch division to the State line, was to effect a connexion between the improvements of New York and Pennsylvania. This connexion is of immense importance to the interests of both States. It will not only add materially to the business done on the public improvements of both, but to the permanent wealth of large sections of the territory of each.

* * * * *

“During the past summer, the Board visited and examined the country around the northern termination of this line of improvements, as well as the contemplated connexions with it in New York. That State has already extended her improvements so as to intersect the Susquehanna by canals at two points, viz.—by the Chenango Canal from Utica on the Erie Canal, to Binghamton on the Susquehanna, thirty-nine miles from the State line, near Athens: and also from Montezuma on the Erie Canal, by Seneca Lake and the Chemung Canal, to Elmira on the Chemung branch of the Susquehanna, sixteen miles above the State line, near Athens. A connexion has also been formed from Montezuma, by the Cayuga Lake and the Ithaca and Owego Rail Road, to Owego on the Susquehanna, eighteen miles from the State line. By surveys made under the direction of the Canal Commissioners of New York, it has been ascertained that a connexion, by either of these routes, is entirely practicable; and from the deep interest which that State has in accomplishing that object, this Board can entertain no doubt that it will, before long, be undertaken and

completed. It is submitted to the Legislature, whether sound policy does not require the adoption of measures, on the part of Pennsylvania, to secure concert of action between that State and this.”

OBSERVATIONS.

It will be seen, by an inspection of the map of New York, that when the connexion shall be completed between the great State works of New York and Pennsylvania, by the extension of the Chenango Canal from Binghampton, the coal of Bradford County, occupying the north-easternmost portion of the great bituminous field, will command the market of the whole valley of the Chenango and adjacent country to Utica, and eastward, being about fifty miles nearer than any other mineral coal: and it will also, in conjunction with the coal of Tioga County, supply the demand hereafter to arise at the great salines of Syracuse and its vicinity, without the possibility of competition. That a due estimate may be formed of the importance of this market, the following statistics obtained on the spot, during the past summer, may be useful. It was ascertained that there were then in operation, in the towns of Salina, Syracuse, Liverpool, and Geddes, all in one vicinity, two hundred salt factories, consuming an aggregate of more than four hundred thousand cords of wood per annum, and the consumption annually increasing. This enormous demand for wood has swept off the forests from the circumjacent country, far and wide: and the principal supplies of that article are now obtained from the vicinity of Lake Ontario, by the Owego Canal.

This latter region will also soon be denuded by such an exhausting consumption, and the bituminous coal of Bradford and Tioga will then be indispensable for the continuance of this important manufacture. In addition to the ample market which will be opened in western New York, upon the completion of the connecting links between the canals of that State and our North Branch, it will be observed, that looking southward to the markets of our own city and New York, by the North Branch Canal, and the connecting improvements of the Lehigh Company, which they anticipate will be completed by September next (see their late Report)—“The bituminous coal of Bradford County,” says their

Report, "will, by this route, be the nearest coal of that description to the markets of Philadelphia and New York," and a large demand may be reasonably anticipated.

TABLE OF DISTANCES.

	Miles.
From the mouth of Wagoner's Lick Creek, near the coal beds of the Towanda Coal Company, to the borough of Towanda, by the contemplated Rail Road, is about -	10
From Towanda to Athens, by the North Branch Canal, -	15
From Athens to Owego, by the contemplated extension of the Chenango Canal, - - - - -	19
From Owego to Binghampton, by the same, - - -	21
	—
	65
From Binghampton to Syracuse and Salina, - - -	80
	—
Total,	145
	—
	Miles.
From Wagoner's Lick Creek to Athens, - - -	25
From Athens to the State line on the Tioga, - - -	4
Thence to Elmira, by the proposed Chemung extension,	16
Thence by Chemung Canal to Havanna, on Seneca Lake,	18
Thence by steam tow-boat to Geneva, - - - -	35
	—
Total,	98
	—
	Miles.
From Wagoner's Lick Creek to Owego, - - -	44
Thence to Ithaca by rail road, - - - -	29½
Thence by steam tow-boat to Falls Creek, junction of Erie canal, - - - - -	40
	—
Total,	113½

The following statistics are extracted from the Lycoming Chronicle of January 28, 1835, containing the results of the investigations of intelligent committees appointed to ascertain the probable consumption of bituminous coal in the region west of Albany. The committee, at Elmira, state, "It has now been shown, and

founded upon the best calculations within reach of your Committee, that there is at present required, for

	Tons Coal.
Smiths' use, - - - - -	53,000
Salt works, - - - - -	33,000
Furnaces and other manufactories, - - - - -	25,000
Domestic purposes, - - - - -	30,000
	<hr/>
Total coal, - - - - -	141,000

For the supply of the country west of Utica, and 30,000 tons of iron and castings."

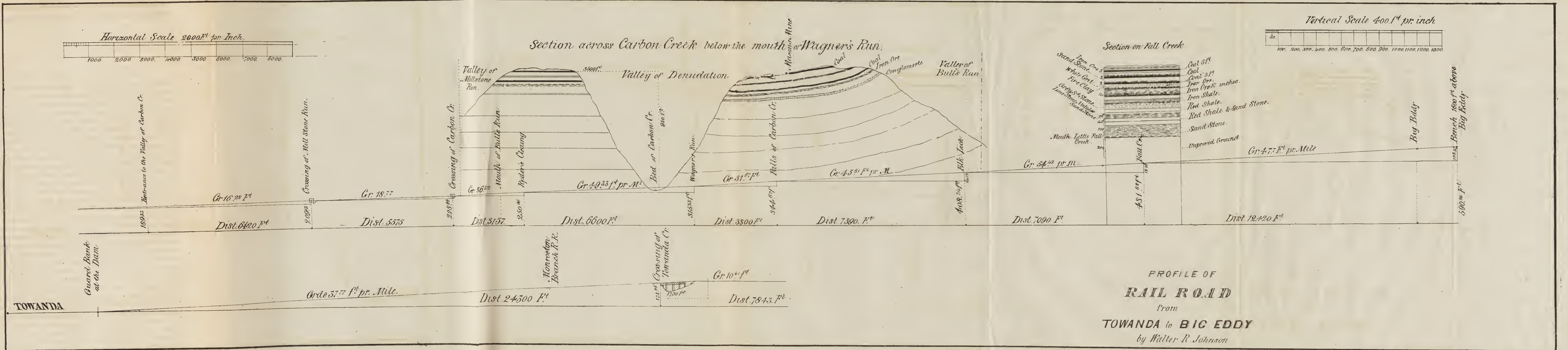
The committee at Geneva, at the same time, made the following estimate of demand, for

	Tons Coal and Iron.
Ontario county, - - - - -	12,000
Seneca and Cayuga, - - - - -	20,000
Onondaga and Oswego, - - - - -	38,000
Madison and Lewis, - - - - -	16,000
Oneida and Jefferson, - - - - -	24,000
Wayne and Munroe, - - - - -	20,000
Livingston and Orleans, - - - - -	10,000
Genesee and Yates, - - - - -	14,000
	<hr/>
Total coal and iron, - - - - -	154,000

There is good reason to believe that the country east of Utica, would annually consume of bituminous coal, - - - - -

100,000

Total coal and iron, - - - - - 254,000



TOWANDA RAIL ROAD AND COAL COMPANY.

AN ACT

To incorporate the Towanda Rail Road and Coal Company.

SECTION 1. *Be it enacted by the Senate and House of Representatives of the Commonwealth of Pennsylvania in General Assembly met, and it is hereby enacted by the authority of the same,* That Bartholomew Wistar, William L. Newbold, Daniel Trotter, Charles Barrington, Robert Bell, Charles Holmes, Thomas Hayes, David Cash, John N. Weston, David M. Bull, Henry Drinker, James C. Biddle, Thomas Elliott, Nathaniel Clapp, James P. Bull, Gorden F. Mason, and their associates, successors, and assigns, be, and they are hereby constituted a body politic and corporate, by the name, style, and title of the Towanda Rail Road and Coal Company, for the purpose of constructing a rail road, as hereinafter is provided; and also for the purpose of mining coal, and for transacting the usual business of companies engaged in mining, transporting, and selling coal, and the other products of coal lands; and the said corporation, by the said name, is hereby declared and made capable in law, to sue and be sued, to plead and be impleaded, to have a common seal, and the same to alter and renew at pleasure, to make rules and by-laws for the regulation and management of the said corporation, consistent with the laws of the United States, and of this Commonwealth, and generally to do and execute, for the well being of said Company, whatever shall lawfully pertain to bodies politic: *Provided,* That nothing herein contained, shall be considered as in any way giving to said Company any banking privileges, or any other privileges or franchises, but such as are incident to making and maintaining said road, and the conveyance of passengers, goods, and commodities thereon, and the transaction of the business of coal companies; but they shall be exclusively confined to the operations pertaining to the business aforesaid, according to the true intent and meaning of this act: *And provided, also,* That each stockholder shall be liable, in his individual capacity, for the debts and performance of

all contracts entered into by the said Company, to the amount of the balance unpaid on the stock of said stockholder.

SECT. 2. The said Company shall have the right to hold, either by purchase or lease, not exceeding three thousand acres of land, at any one time; the whole to be within the county of Bradford, in the Commonwealth of Pennsylvania; and the same, or any part thereof, to sell or otherwise dispose of, as the interest of the Company may require: *Provided*, That the said Company may hold, as above, such lot or lots of land, not exceeding five acres in any one place, as may be found convenient as places of deposit, in the transportation and sale of the products of their mines.

SECT. 3. The capital stock of said Company shall be and consist of three hundred thousand dollars, and shall be divided into six thousand shares, of fifty dollars each; which capital stock shall only be employed in constructing rail roads, in the holding and purchasing the lands aforesaid, with the improvements, if any, thereon, and in constructing such other improvements, building cars, boats, engines, and machinery, as may be necessary or useful for constructing said rail road, and for the mining, transportation, and sale of coal, and in the payments of such salaries, wages, and other expenditures, as shall be requisite for the purposes aforesaid of the Company; and said stock shall be assignable and transferable, according to such rules as the board of directors shall establish.

SECT. 4. When the above named Bartholomew Wistar, William L. Newbold, Daniel Trotter, Charles Barrington, Robert Bell, Charles Holmes, Thomas Hayes, David Cash, John N. Weston, James P. Bull, Gorden F. Mason, David M. Bull, Henry Drinker, James C. Biddle, Thomas Elliott, Nathaniel Clapp, and their associates, shall have subscribed the whole number of shares aforesaid, and actually paid and expended not less than fifteen per cent. of the capital aforesaid, in purchasing lands, and in such other investments as are authorized by this act for the use of said Company, the governor, on due evidence thereof, shall, by letters patent, under his hand and the seal of the State, create and erect the said Bartholomew Wistar, William L. Newbold, Daniel Trotter, Charles Barrington, Robert Bell, Charles Holmes, Thomas Hayes, David Cash, John N. Weston, James P. Bull, Gorden F. Mason, David M. Bull, Henry Drinker, James C. Biddle, Thomas Elliott, Nathaniel Clapp, and their associates, successors, and assigns, into one body corporate, by the name, style, and title of the Towanda Rail Road and Coal Company.

SECT. 5. The affairs of the said Company shall be managed by

seven directors, to be chosen annually from the stockholders; the first election shall be held in the city of Philadelphia, within sixty days after letters patent aforesaid shall have issued; of which election, public notice shall be given by four or more of the corporators named in the first section of this act, at least two weeks prior thereto, in one newspaper printed in the county of Bradford, and two or more newspapers printed in the city of Philadelphia; and the subsequent elections shall be held annually, at such convenient time and place as the directors shall determine; of which thirty days' previous notice shall, in like manner, be given by the president of said Company, or by any five of the directors: *Provided*, That in the event of a failure to hold such election, the former directors may continue in office for a period not exceeding six months, or until such election shall be held.

SECT. 6. The election for directors shall be held by ballot, and each stockholder shall be entitled to vote according to the number of shares held by said stockholder, in the proportion following, that is to say: for each share, not exceeding four shares, one vote; for every four shares above ten, and not exceeding thirty, one vote; for every ten shares above thirty, and not exceeding one hundred, one vote; for every twenty shares above one hundred, one vote. No share shall confer a right of voting, which shall not have been transferred at least three calendar months prior to the day of election, nor unless it be bona fide held, or owned by the person in whose name it appears, in his own right, or in that of his wife, or for his or her sole use and benefit, or as executor or administrator, trustee, or guardian, or in the right of, and for the use and benefit of some copartnership, society or corporation, of which he or she may be a member; and all votes by proxy, shall be on such terms and conditions as are prescribed by the act of twenty-eighth of March, one thousand eight hundred and twenty, entitled "An act to regulate proxies."

SECT. 7. The directors shall, as soon as convenient after their election, choose one of their number as President, to serve for one year. They shall also have power to appoint, as occasion may require, all other officers and agents of the Company, and to supply vacancies in the Board, arising from death, resignation, or otherwise, until the next annual election; at all meetings of the Board, four directors shall form a quorum to transact business.

SECT. 8. The directors may, from time to time, call in, on thirty days' notice thereof, in at least one newspaper printed in the county of Bradford, and two daily papers printed in the city of

Philadelphia, such instalments on the stock of said Company as they may judge best, not exceeding twenty per cent. thereof, at any one time and place appointed; and if any instalment on the stock so called in, shall remain unpaid for the space of thirty days after the time so appointed, every such stockholder, or his or her assignee, shall, in addition to the instalment so called for, pay at the rate of two per centum per month, for the delay of such payment; and if the same and additional penalty remain unpaid for such length of time, as that the accumulated penalty shall become equal to the sums before paid in part, and on account of such shares, the same shall be forfeited to the said Company, and may be sold to any person or persons willing to purchase, for such price as can be obtained for the same; or in default of payment by any stockholder, of any such instalment, as aforesaid, the president and directors may, at their election, cause suit to be brought before an alderman, or justice of the peace, or in any court having competent jurisdiction, for the recovery of the same, together with the penalty aforesaid: *Provided*, That no stockholder, whether an original subscriber or assignee, shall be entitled to vote at any election, or at any general or special meeting of the said Company, on whose share or shares, any instalments or arrearages may be due and payable, more than thirty days previously to said election or meeting.

SECT. 9. Dividends of so much of the profits of the Company, as shall appear to the directors advisable, shall be declared twice a year, and paid to the stockholders or their legal representatives, on demand, at any time after the expiration of ten days, after having been declared; but said dividend shall in no case exceed the amount of the nett profit actually acquired by the Company, so that the capital stock shall never be thereby impaired; and if any dividend shall be declared, which shall impair the capital stock of said Company, the directors consenting thereto shall be liable, in their individual capacities, to said Company for the amount of stock so divided; and each director present, when such dividend shall be declared, shall be adjudged consenting thereto, unless he shall forthwith give public notice to the stockholders of the declaring of such dividend: *Provided*, That whenever the dividends shall exceed six per cent. per annum, the said Company shall pay a tax of eight per cent. on all such dividends into the treasury of the State, for the purposes of education; and the president or secretary of said Company shall annually, in the month of January, transmit to the Legislature, under oath or affirmation, a statement

of the receipts and expenditures thereof, and of any dividends that may have been declared during the preceding year.

SECT. 10. The Company hereby incorporated, shall have power to survey, lay down, and ascertain such route as they shall deem expedient for a rail road, with double or single track, beginning at a convenient point on the Pennsylvania Canal, at or near the borough of Towanda, in Bradford county, and to extend the same to the coal lands in Franklin township, in said county, and shall have the right of extending said road, or of constructing lateral rail roads therefrom, to such coal mines in said township, or its vicinity, as from time to time may be found expedient, with the right also to extend the same, so as to form a junction with the Williamsport and Elmira Rail Road, at such part thereof as they may find practicable; and the said rail road shall not pass through any burial ground, place of public worship, or dwelling house, without the consent of the owner; and the said Company shall, within six months after ascertaining the route of said rail road, cause an accurate survey of the lines of said road to be made, a map or plot of which survey, they shall cause to be filed in the office of the Secretary of State; which map or plot, or certified copy thereof, shall be sufficient evidence of the route of said road, which may then be opened, and all the expenses thereof shall be defrayed by said Company.

SECT. 11. That the said Company shall have power, by themselves or agents, to enter in and upon such lands as may be necessary to make the rail road aforesaid, and also have liberty of taking from any land in the neighbourhood, gravel, stone, wood, or other materials necessary for the construction of said rail road, paying, if the owner of said land and said Company can agree, the damages they shall do to said lands; or, if they cannot agree thereon, the damages shall be ascertained in the manner hereinafter prescribed, as to the compensation for lands over which said rail road shall be laid.

SECT. 12. That whenever it shall be necessary for the said Company to enter in and upon and occupy, for the purpose of making said rail road, any land upon which the same may be located, if the owner or owners of said land shall refuse to permit such entry and occupation, and the parties cannot agree upon the compensation to be made for any injury or supposed injury that may be done to said land, by such entry and occupation, then it shall be lawful for the court of common pleas of the county in which the land lies, on application of either party, and at the cost

and charges of said corporation, to award a *venire* directed to the sheriff of the county, requiring him to summon a jury of disinterested men to view, examine, and survey the said lands, tenements, or hereditaments, and estimate the injury or damages, if any, that in their opinion will be sustained, as aforesaid, by reason of said rail road, and report the same, under their oaths and affirmations, to the said court; which report being confirmed by the said court, judgment shall be entered thereon; and the said sheriff and jurors shall be entitled to the like fees for their services, as are allowed by law, in other cases of special juries, to be paid by said Company; and it shall be the duty of the said jury, in estimating such injury or damage, to take into consideration the advantage that will be derived to the said owner or owners of such lands, from said rail road: *Provided*, That either party may appeal to the court, within thirty days after such report shall have been filed in the prothonotary's office of the proper county, in the same manner as appeals are allowed in other cases; and upon the filing of such report or inquisition, and the confirmation thereof, or upon final judgment, on appeal therefrom, and the said Company paying to such owner the amount in said report or judgment specified, in full compensation for said lands, or for the injury sustained, as aforesaid, the said Company shall become seized of the same estate in the said lands which the owner held in the same; and they, and all who act under them, shall be acquitted, and freed from all responsibility, for or on account of such injury: *Provided*, That the payment of damages aforesaid, for the land through which the said road may be laid, shall be made before the said Company or any person under their direction, or in their employ, shall be authorized to enter upon or break ground in the premises, except for the purpose of surveying and laying out said road, unless the consent of the owner or owners be first obtained.

SECT. 13. That the said rail road shall be so constructed, as not to impede or obstruct the free use or passage of any public road or roads, which may cross or enter the same; and in all cases where the said rail road may cross, or in any manner interfere with any existing public road, the said Company shall make, or cause to be made, a good and sufficient causeway or causeways, to enable persons passing or travelling said public roads, to cross and pass under or over the said rail road; and if the said Company shall neglect or refuse to keep such way or causeways in good repair, they shall be liable to a penalty of ten dollars, for every day the same shall be so neglected, or refused to be repaired, to be recovered by the

supervisors of the township, with costs, for the use of the township, as debts of like amount are by law recoverable; and shall, moreover, be liable to all actions, at the suit of any person who may be aggrieved thereby.

SECT. 14. That for the accommodation of all persons owning or possessing land, through which the said rail road may pass, it shall be the duty of the said Company to make, or cause to be made, a good and sufficient causeway or causeways, wherever the same may be necessary, to enable the occupant or occupants of said lands to cross or pass over the same with wagons, carts, and implements of husbandry, as occasion may require; and the said causeway or causeways, when so made, shall be maintained and kept in good repair by said Company; and if the said Company shall neglect or refuse, on request, to make such causeway or causeways, or, when made, to keep the same in good order, the said Company shall be liable to pay any person aggrieved thereby, all damages sustained by such person, in consequence of such neglect or refusal, to be paid for and recovered before any magistrate or court having cognizance thereof: *Provided*, That the said Company shall in no case be required to make, or cause to be made, more than one causeway through each plantation or lot of land, for the accommodation of any one person owning or possessing land through which said rail road may pass; and when any public road shall cross said rail road, the person owning or possessing land through which said public road shall pass, shall not be entitled to require the Company to erect, or keep in repair, any causeway or bridges, for the accommodation of the occupant of said land: *Provided, further*, That in the event of any private bridge or causeway being converted to public use, so as to be made to accommodate a public road laid out subsequent to the passage of this act, then, and in such case, the Company shall be forever thereafter exonerated from the duty of keeping the said bridge or causeway in repair.

SECT. 15. No suit or action shall be brought or prosecuted by any person or persons, for any penalties incurred under this act, unless such suit or action shall be commenced within ten months next after the offence shall be committed, or the cause of action shall have accrued; and the defendant or defendants in such suit or action, may plead the general issue, and give this act and the special matter in evidence, and that the same was done in pursuance and by authority of this act.

SECT. 16. If any person or persons shall wilfully and know-

ingly break, injure, or destroy the rail road, or any part thereof to be erected by the said Company, in pursuance of this act, he, she, or they, shall forfeit and pay to the said Company, three times the actual damages so sustained, to be sued for and recovered, with costs of suit, in any court having cognizance thereof, by action of debt, in the name and for the use of said Company.

SECT. 17. The said Company shall be entitled to receive toll from all persons travelling on said road, that is to say: on each ton of coal, one and a half cents per mile; on each ton of salt, gypsum, and lime, two cents per mile; on brick, two cents per ton per mile; lumber, square and round, for every hundred feet solid, two cents; on boards, planks, scantling, or other sawed stuff, reduced to inch stuff, two cents for every thousand feet per mile; on shingles, per thousand, one and a half cents per mile; on staves and heading, for pipes and hogsheads, per mile, two cents per thousand staves; and headings for barrels, and other vessels of less size, one cent per mile per thousand; for all other articles not enumerated, three cents per ton per mile; on all single and detached articles, weighing less than a ton, it shall be lawful to charge and receive, on the transport thereof, an advance of ten per cent. on the rates, as above stated.

SECT. 18. That in all suits or actions which may be brought against said Company, the service of process upon any manager, toll-gatherer, or other officer of the Company, shall be as good and available in law, as if made on the president thereof.

SECT. 19. That the said road shall be a public highway. On the completion of a section of five miles or more of the rail road, all transportation on the same, of whatever nature or kind, shall be carried on and conducted under the superintendence and direction of said Company, who shall make rules for the regulation of all travelling and transportation on the same, and alter the same as they may deem expedient; and it shall be lawful for any Company that may be hereafter incorporated by any law of this Commonwealth, or any individual or individuals, to intersect said rail road or rail roads, at any place where it may be deemed expedient, so that the same may be in such manner as not to injure the same.

SECT. 20. This act shall continue in force until the first day of May, in the year of our Lord one thousand eight hundred and sixty-four, and no longer; and if the said corporation shall not commence the construction of the said rail road within the term of three years, and complete the same as far as the coal lands in Frank-

lin township, within seven years from the passage of this act, then this charter shall be null and void.

SECT. 21. If any increase of capital stock be deemed necessary by the stockholders to complete the said rail road, or to extend the same, it may be lawful for the said Company, at a stated or special meeting to be convened for the purpose, to increase the number of shares, so that, in the whole, they shall not exceed ten thousand shares; and to receive and demand, for shares so subscribed, the moneys in like manner, and under like penalties, as is hereinbefore provided for the original subscription, or as shall be provided for by their by-laws.

SECT. 22. The Legislature hereby reserve the right to amend, alter, and repeal the charter hereby granted, whenever they think proper, in such manner, however, that no injustice may be done to the corporators; and the Legislature reserves the right to purchase the said road, at any time after twenty years from the passage of this act, by paying to the said Company a sum of money, which, together with the tolls received, shall equal the cost and expenses of said rail road, with an interest of six per cent. per annum thereon.

WILLIAM HOPKINS,

Speaker of the House of Representatives.

P. S. MICHLER,

Speaker of the Senate, pro tem.

Approved—the twelfth day of June, eighteen hundred and thirty-nine.

DAVID R. PORTER.

PENNSYLVANIA, ss.

Secretary's Office.

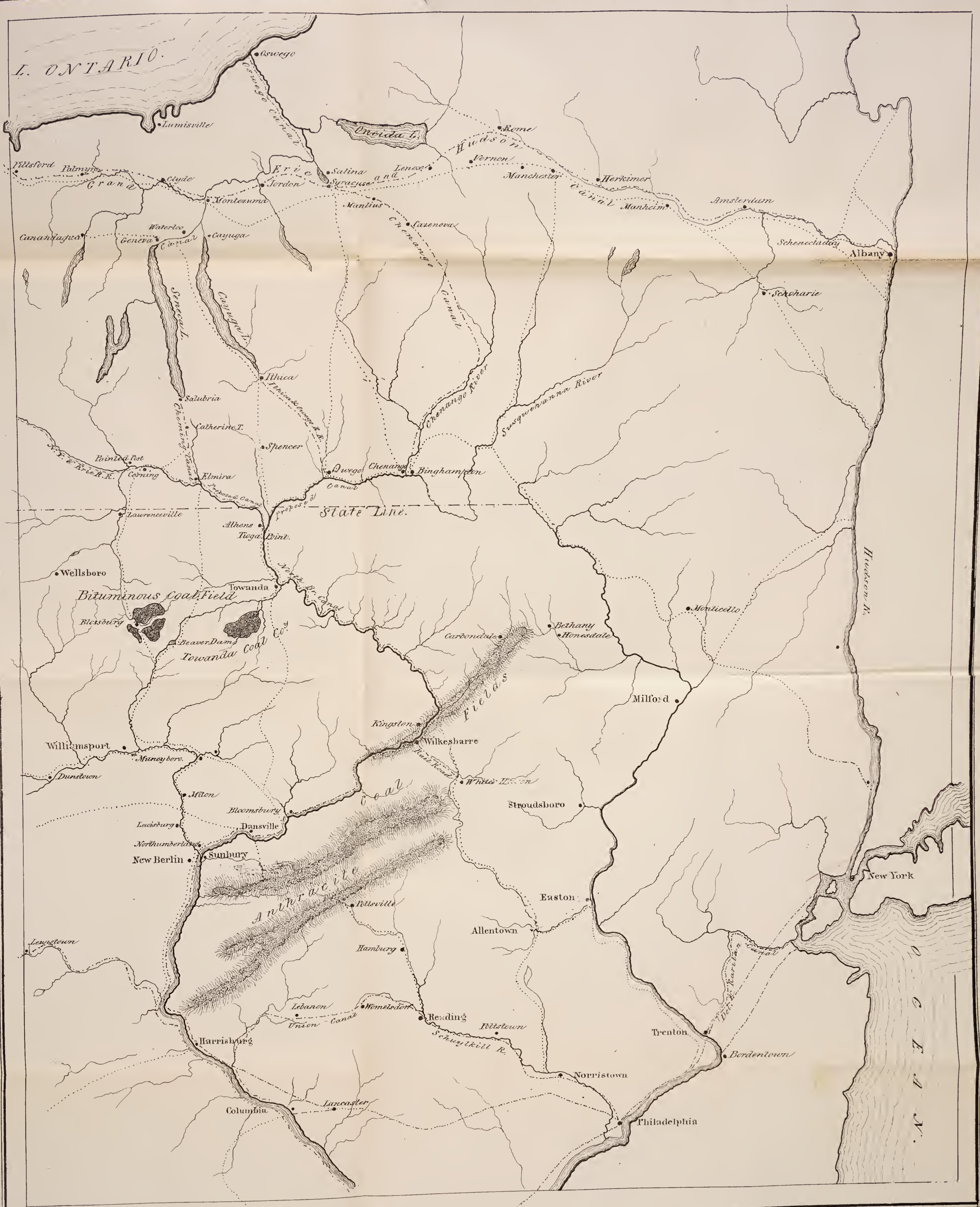
I do certify that the above and foregoing is a true copy of the original act of the General Assembly of this Commonwealth, as the same remains on file in this office.

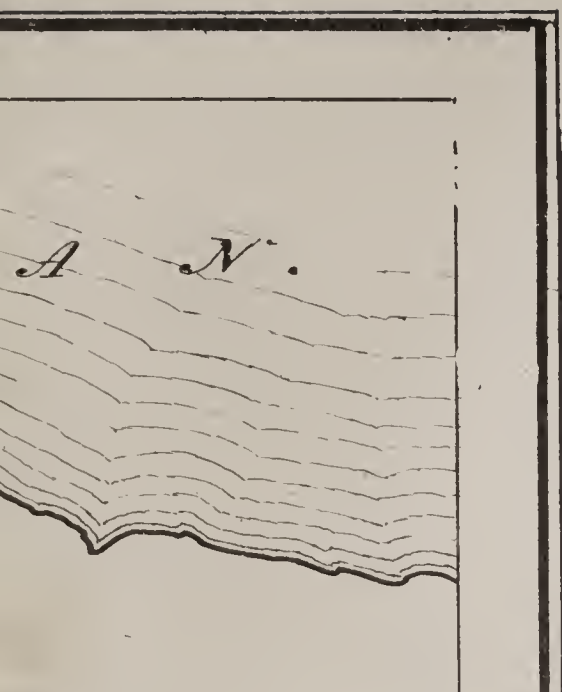


In testimony whereof, I have hereunto set my hand, and affixed the seal of said office, at Harrisburg, the twenty-fourth day of June, in the year of our Lord one thousand eight hundred and thirty-nine, and of the Commonwealth the sixty-third.

FR. R. SHUNK,

Secretary of Commonwealth.





REPORT
OF A
SURVEY AND EXPLORATION
OF THE
COAL AND ORE LANDS,
BELONGING TO THE
Allegheny Coal Company,
IN
SOMERSET COUNTY, PENNSYLVANIA,
ACCOMPANIED BY MAPS, PROFILES, AND SECTIONS.

6
+ 40 = 46

BY WALTER R. JOHNSON, A. M.

PROFESSOR OF CHEMISTRY AND NATURAL PHILOSOPHY, IN THE MEDICAL DEPARTMENT OF PENNSYLVANIA COLLEGE, PHILADELPHIA.

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1841.

Copy 4.

R E P O R T.

TO THE ALLEGHENY COAL COMPANY.

Gentlemen :

HAVING examined and surveyed the lands constituting your domain, situated in Southampton township, Somerset county, Pennsylvania, I beg leave to offer the following results of my investigations.

The plan of conducting this survey was, after having made some preliminary reconnoissances to obtain a general knowledge of the structure of the country, and the limits of the mineral deposits, to determine the general direction of the strata, and their inclination in different parts of the region. These points having been approximately decided, the next object was, to fix by careful survey and levelling, the relative positions of the several beds, and of the interposed strata of rocks. This purpose was effected by carrying lines longitudinally and transversely over the main dividing ridge between the waters of Jennings's and Gladden's run, from the Little Allegheny, to the Savage mountain, and connecting, as they were severally reached, the different exposures of the various beds.

By thus ascertaining the position and elevations of the beds as found in different parts of the formation, it was a matter for comparison and calculation, to fix the section of the coal-trough in each direction; and to compute its depth and other dimensions. Having completed these surveys and levellings for geological purposes, the other objects to be effected on the ground, were to ascertain the length and grade of a line of rail-road which might connect the lands of the company with the line of public improvements, by which they might be rendered available; and to measure the thickness of the several mineral deposits, taking from each the proper samples for analysis. The field work being thus completed, it became necessary to arrange all the data thus obtained, to plot and reduce the maps, profiles, and sections; and to go through an analysis of coals, iron ores, and limestones, found in the various exposures of the beds.

The lands of your company lie in the north-easterly part of the coal-trough, which is situated partly in the state of Pennsylvania, and partly in Maryland and Virginia. Those lands are chiefly situated on a ridge of considerable elevation, which divides the north fork of Jennings's run, from the south-westerly heads of Gladden's run. This ridge may be traced from Beale's Gap, in the Little Allegheny mountain, to Reiber's Gap, on the Savage mountain; and the distance from the Penn-

sylvania and Maryland line is in no part of the tract more than two and a half miles.

The situation of these lands is one of the most favourable in Pennsylvania for supplying with bituminous coal the great Atlantic market. After many years spent in exploration, surveys and levellings, to ascertain the most favourable route for a connection between the Potomac and the Ohio, the Baltimore and Ohio Rail-road Company have fixed upon the course of Will's creek, as the location of their road. This line of communication therefore passes within little more than two miles of the north-easterly extremity of the company's land; and the Chesapeake and Ohio Canal Company have determined on locating a basin for that work at the mouth of Jennings's run, about five and a half miles by the course of the latter stream from the coal openings on the property of your company, and only three miles by the course of Will's creek, above the town of Cumberland. The locations to which I have just referred will be found to render the north-eastern extremity of the Southampton coal field more accessible than any other portion of this rich and valuable basin. While such is the situation of these lands with reference to lines of the public works—and while the products of the mines may find through the channel of the Chesapeake and Ohio Canal, a transportation not exceeding 190 miles, with a descent of 690 feet, to reach tide-water, the lands them-

selves are so situated as to render the prosecution of mining operations far less expensive than in many other situations. Many of the mineral beds can be approached and worked without vertical shafts, or slopes requiring stationary power for extracting the materials. Six workable beds of the coal are wholly above water-level; and portions of those which, at the centre of the basin, lie beneath that level, rise at their out crops to a high elevation on the flanks of the two mountains which constitute the boundaries of the basin.

This circumstance of working by horizontal drifts instead of vertical shafts, and that of finding a conveyance to market, without the necessity of constructing long lines of private rail-road, are advantages possessed by few of the bituminous coal districts, of which the products will seek the Atlantic market. By a reference to subsequent parts of this report, it will be found that the distance over which a company rail-road, to connect the coal of this basin with the canal as above mentioned, must be made, is not above five and four-fifth miles; and that the first coal beds reached on this route, are not more than three and a half miles from the canal basin at the mouth of Jennings's run, and at an elevation of 290 feet above that point. These latter beds, which have formerly been worked to a limited extent, are therefore but 980 feet above tide, with a continuous descent. The advantage which a rail-

road constructed from the mouth of Jennings's run to the coal mines of the company would enjoy, would not be limited by the accommodation it would afford to their own operations, but it would profitably accommodate the trade descending along the south fork of Jennings's run, from the neighbourhood of Frostburg. This source of revenue might be safely calculated on, as the rich mineral beds of the company are known to extend in that direction ; and their value, both for the supply of coal, and for the manufacture of iron, has been already demonstrated.

To the above general remarks I may add, that the richness of this coal formation in argillaceous carbonates of iron and in limestone, is such, as to warrant the establishment and prosecution of iron works, on the most extensive scale which the necessities of the country shall require. When this, and similar coal districts of our country, come to be duly appreciated, there will, I conceive, be a total cessation of the ruinous practice of contracting debts abroad for supplying this important article of consumption—an article, which there appears to be as little need of bringing from abroad into the United States, as there is of importing the raw cotton of India, the timber of Norway, the wheat of Poland, or the bricks of Holland.

GEOLOGICAL CHARACTER OF THE COUNTRY.

THE character of the formation in which the coal of Southampton exists, is in all its leading features entirely similar to that found in other bituminous coal regions, both of the old and new world. It is a secondary formation, reposing in a trough or canoe-shaped cavity, between two upheaved ridges which run nearly parallel to each other in a direction from north-east to south-west ; and consequently the strata which are inclined towards a central north-east and south-east line dip from one of these ridges, (the Savage mountain,) towards the south-east, and from the other, (the Little Allegheny mountain,) they dip towards the north-west. In the central line, the position of the strata becomes, of course, for a short distance, nearly horizontal ; and as we recede from this line they are seen to be more and more highly inclined to each other.

The evidences of the true character of the two ridges, that of up-curved portions of the stratification, were abundantly presented to view at the several gaps in these ridges, which I was enabled to visit ; and on both sides of the coal field I traced the rock formation to points where it again became inclined *from* the central line of the coal-trough in question.

Thus, in passing through the gap in the Little Allegheny mountain, which affords a passage to

the waters of Gladden's run, I was enabled to observe at Compt's old mill-dam, an inclination S. 75 degrees, E. 81 degrees; while at Mattinger's shop higher up the stream, the inclination is N. 45 W. 85 degrees. Between this point and Emerick's mill, we find successively dips in the same direction, 43 and 36 degrees. At Emerick's mill, where the conglomerate rock is found in place, and a little above which, a bed of coal is opened, the inclination is still north-west, but the angle has diminished to 22 degrees. At Daniel Hoyman's, on the road which ascends the south branch of Gladden's run, the slate rock has a dip N. 38 W. of 9 degrees; and at Baker's place, N. 28 W. 8 degrees. At Gaumer's big vein it is N. 15 W. 5°. These last three observations appear to favour the supposition that the ridge between the waters of Gladden's and Jennings runs, is in fact saddle-shaped, dipping into the valleys of the streams, as well as towards the centre of the trough, as already mentioned.

At the mouth of Jennings run, the rocks were observed to dip N. 45° W. 80°.

At a crossing of Jennings run, below the junction of the north and south forks, the dip was found to be N. 51° W. 65°. On the red shale rock some distance below the conglomerate, N. 40½ W. 17°; from this point to Uhl's mill, the inclination of the strata cut through by the stream appears to diminish gradually, until at the latter

point, it is N. 45 W. $4\frac{1}{2}$ degrees. Some additional facts were observed with respect to the inclination of the rocks, on the flank of the Little Allegheny, particularly north of Beale's Gap, where the conglomerate standing high above the other members of the coal series, probably on account of its greater degree of durability, has an inclination N. 45 W. 60° . At Beale's Gap also, the sandstone above the conglomerate dips N. 50 W. 33° ; but having passed from this point over the edges of several of the lower beds of coal and their interposed rocks, towards the synclinal axis or bottom of the trough, we perceive the formation to be gradually becoming more and more nearly horizontal, until we reach the rounded hill near the house of Henry Hoyman, which seems to repose in the centre of the trough, and to contain some higher members of the original formation than are met with in any other part of the trough over which my lines of survey extended. From the base of this central bluff we advance towards the north-west, up the flank of the Savage mountain, over strata, at first only moderately inclined, and find, as we proceed, still further evidences of the saddle-shaped figure assumed by the strata, constituting the ridge.

Thus we have on the south-westerly side of the ridge at Hardin's old and new openings, a dip S. 8 W. 6° , instead of S. 45° E., as we might expect from the general bearing of the mountain

ranges and of the main axis of the coal-trough. On the other hand, above Daniel Lepley's, on the Gladden's run side of the ridge, the inclination is S. 60 E. 24°—then S. 55° E. 15°—and not far below, on the Jennings's-run side of the slope, S. 30 E. 15°. S. 35 E. 17°. All these observations are within a few rods of each other, and indicate that the waters of the two runs, have, in excavating their channels, more than 1000 feet deep into the formation, been directed by other than accidental circumstances, in reference to the courses which they have respectively traced. Instead of finding the basset edges or out-crops of the several beds in a straight line along the flanks of the two mountains, we ought, if the results of the foregoing observations be properly estimated, to have scolloping or waving lines of crop, in situations where their upper lines are observed.

Following the general course of the inclination, we notice on the flank of the Savage mountain, on the old Somerset road, below its junction with the turnpike, the dip S. 45 E. 20°. On the conglomerate rock, in place near Reiber's gap, S. 38° E. 23°. At Reiber's new ore bed, S. 45 E. 31°; and on the ridge of the Savage mountain, was observed a dip of the grey sand-stone, composing it, S. 45 E. 40°. On passing further to the north-westward, and crossing Savage run, Laurel run, the Scaffold Camp fork, and arriving at the head waters of the Flaugherty's creek, we cross over a line of anti-

clinal elevation, and find at length a dip N. 48 W. 18 degrees. This comes in fact to the westerly slope of the Allegheny mountain.

We thus discover, that the coal-trough under consideration, reposes in one of the downward flexures or *wrinkles* of the stratification, so common in Middle Pennsylvania, and which, combined with the extensive denudation of certain parts of the elevated strata, render the geological interpretation of the present surfaces somewhat more intricate than they would have been, if no such corrugations had taken place.

That side of the trough which reposes on the flank of the Savage mountain, and which, consequently declines towards the south-east, is found, according to the foregoing observations, to have a more rapid inclination than that which rests on the slope of the Little Allegheny. In other parts of this coal-trough, as we learn from Professor Ducatel's report on the geology of Maryland, the reverse appears to hold. Some few observations which were recorded, appear to favour the supposition, that there is on the whole, a slight southwestern inclination of the whole formation in this part of the Savage mountain coal field; and that not many miles to the north-eastward, we should encounter the outcropping of the strata composing the ends of the trough.

The angles of inclination above-cited, together with the breadth of the deposit of coal mea-

asures, prove that it must possess no inconsiderable depth at the centre; and though the lowest strata of coal and iron-ore, discovered in ascending Jennings's run, soon after passing the thick bed of conglomerate rock, $3\frac{3}{5}$ miles above its mouth, together with several others of the mineral beds, between that point and the village of Wellersberg, are no more seen, on account of their dipping below the level of the creek; yet as we have many data to determine the inclination of the measures, the depth to which the lower beds must descend in the *centre*, before they again rise to the opposite side of the trough, is determined within sufficiently circumscribed limits. The number of points at which the eight feet vein of coal, seen near Hoyman's place, is opened, and the readiness with which it is distinguished from other beds, above and below it, afforded an opportunity of determining the position of the strata generally; especially on the south-eastern side of the *trough*; and the only assumption necessary, in order to locate properly the inferior beds, is, that the thickness of the several strata is constant, which, though perhaps not rigorously, is probably at least, so nearly true, as to be assumed without subjecting us to material error. It would be highly satisfactory to witness a direct development of all the members of the series above water-level in this part of the basin, by means of trenches opened upon the steep sides of the slope, exposing the edges of the strata. In the absence of this method of research, I have

sought to connect, in as unexceptionable a manner as possible, the points where openings do exist; and thus to construct a section which may serve as a general guide, subject to such corrections as future and more minute examinations shall render necessary.

An inspection of the accompanying section will show that the lower bed of coal, opened near the point where the south fork of Jennings's run, (which comes from near Frostburg,) joins the north fork, must, in the centre of the basin, be found even below the level of the town of Cumberland, and that it must be at least 1300 feet below the top of the central hill, still resting in the middle of the trough, near Hoyman's house. The old coal openings at the forks, are only three hundred feet above the mouth of Jennings's run; and as the latter point is known to be 684 feet above tide, we have at this point, a coal bed 984 feet above tide-water, capable of being mined by horizontal drifts, and presenting a breast of at least 4000 feet, on the slope of the Little Allegheny mountain, before it would reach the out crop, where it was observed near Beale's Gap.

MINERALS.

The mineral substances most abundantly distributed over the lands which I examined, are coal, iron-ore and limestone, with some fire clay.

By reference to the accompanying section, constructed in general from an actual, examination of the position of each bed, it will be observed, that about twelve different strata of coal have already been ascertained to exist; and that of these, not less than six or seven are susceptible of profitable working, and have actually been wrought on some limited scale, to supply the demands, either of the immediate neighbourhood, or of the public armory at Harper's Ferry. It is said to be not less than forty years since some of the lower beds began to be explored for these purposes; but from the limited demand for coal then existing, and the total absence of skill in mining among the inhabitants, together with the uncertain and hazardous mode of transportation by boats and arkso n the Potomac in time of floods, very little coal was ever taken out; and the various short drifts once opened, are now closed up, or so dilapidated as to be scarcely capable of examination. Several of these lower beds are from two to four feet in thickness. From the best information which I could collect, relative to the thickness of these, and from my own observations in the higher beds of the formation, I am led to the belief, that the total amount of workable coal in the formation, does not fall short of thirty feet.

Coal from four of the beds has been more particularly examined, but of all the portions formerly worked, good coal has been extracted, and its

general character among those who have used it, is a sufficient guarantee for the disposal of any quantity which could be brought to market on the sea-board.

ANALYSIS OF COALS.

No. 1. The first sample analyzed was from the eight feet bed, opened not far from H. Hoyman's place, at the centre of the trough, and near the highest part of the dividing ridge, between the waters of Jennings' and those of Gladden's run. This coal has a rather open structure, and jet black colour, or occasional iridescent tints, with portions of alternate bright and dull black surface. The surfaces of deposition are well marked, and the two sets of slines or cleats, are, in the sample before me, at angles of about 105° and 75° , with each other, giving a rhombic structure in that direction.

The specific gravity of this coal is 1.3432		
Heated to 220° Fah. it loses	1.2	per ct.
When fully coked, it yields of water		
and other condensible matter,	4.0	"
And of uncondenscible gas,	16.8	"
It contains of earthy matter,	8.1	"
And of solid carbon,	69.9	"
	<hr/> 100.00	

The ashes are dense, of a reddish gray tint, and obviously contain a considerable proportion of oxide of iron, and probably a small per cent. of manganese; not enough, however, it is believed, to interfere, in the least, with the use of this coal for smelting iron.

No. 2. This specimen of coal was taken from the new opening on Uhl's upper vein, so called, some distance down the slope, below Hoyman's opening, on the big vein above alluded to. This bed is 84.14 feet below the preceding. Its thickness, measured at an old drift at some distance from the point where this new opening was made, was found to be 4 feet 9 inches, including a ply of slate of variable thickness, from 9 to 12 inches. The new opening had not, at the time of my visit, been so effectually opened as to enable me to determine exactly its thickness, but it is, doubtless, equal to that observed in the other opening.

The specific gravity of this coal is 1.3195		
Heated to 220° Fah. it lost,	2.00	per ct.
And when fully coked it gave—		
in combined water and other		
condensable vapours,	1.4	“
And of uncondensable gas,	16.8	“
The earthy matter, bright buff or		
fawn-coloured ashes, is	4.05	“
Carbon,	75.75	“
	<hr/>	
3	100.00	

The ashes are remarkably light, forming, in this respect, a singular contrast with those of No. 1.

No. 3. This sample was taken from an opening on the land of D. Korns, adjoining those of the company, on the north-east side of the dividing ridge, between the waters of Jennings's and Gladden's runs. The bed is 50.6 feet lower than the level of Beale's Gap, while the bed, called Uhl's upper vein, is opened on the other side of the ridge, at an elevation of 53.6 feet below the same gap. As far as exterior indications go, the identity of these two beds, appears to be established.

The coal from Korns's opening is of a cubical structure, colour deep black, lustre not remarkable.

Its specific gravity is 1.386

It loses by heating to 300°	1.4	per ct.
The volatile matter lost in coking is		
in addition,	18.7	"
The earthy matter is,	11.44	"
Carbon,	68.46	"
	<hr/>	
	100.00	

In coking, this coal swells but little, and the coke is dense, dark gray, and without lustre. The ashes are dense, inclining in colour to the fawn, but rather deeper, and might, perhaps, be described as between a fawn and a flesh colour.

No. 4. This sample was taken from an opening

recently made on the land of Schaeffer, adjoining the Weller tract of the company. The level of this opening is 485 feet below Beale's Gap, about 34 feet lower than the opening in Weller's field, and 63 feet higher than the opening on the "Meeting-house vein," from which it is distant one fourth of a mile, in a north-westerly direction. This opening appears to be a little to the north-west of the central line or synclinal axis of the trough, but cannot be far advanced towards the Savage mountain side of the basin. The coal is of good appearance, both in colour and texture. Its surface, shining, or covered with a slight film of oxide of iron.

Its specific gravity is 1.370

At 300° it loses of moisture	1.3	per ct.
By coking, it loses in addition, of		
bitumen,	17.5	"
The quantity of earthy matter is,	10.5	"
And the unvolatilizable carbon,	70.7	"
	<hr/> 100.00	

The ashes are dense, and of a chocolate brown colour, indicating a considerable quantity of metallic oxide. The coke is bulky, but of excellent appearance, having a steel gray lustrous exterior, but is porous internally.

No. 5. This coal is from Hoyman's eight feet bed, but a different ply from the sample given in

No. 1. The colour is nearly jet black, shining, structure rhomboidal, foliated, and occasionally exhibiting local contortions of the grain. The surfaces of superposition are strongly marked; and the main slines, or cleavages, are inclined to those surfaces, in an angle of about 30 and 150 degrees.

Its specific gravity is 1.363

At 300° it parts with moisture to

the amount of	1.1	per ct.
---------------	-----	---------

And in coking loses in addition, of

volatile matter,	17.2	“
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It contains of earthy matter,	10.2	“
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And of unvolatilizable carbon,	71.5	“
--------------------------------	------	---

100.00

The ashes are of nearly as light a colour as those from hickory wood, but with a slight reddish tinge, are bulky, and appear to contain but little metallic oxide.

The coke is not voluminous, and has a steel-like colour and brightness. No sulphur was detected in the course of this analysis, though traces of sulphuret of iron do occur in some plies of this bed of coal.

No 6. This coal is from Hoyman's six-feet bed. The structure is rhomboidal, the colour of the surfaces of superposition, when developed, is a dead black, on the edges of the plies, shining and deep

black. The roof of the drift is 110 feet below the level of Beale's Gap.

The specific gravity of the coal is 1.362

At 300° it loses of moisture, 1.30 per ct.

By coking, it parts with an additional quantity of volatile mat-

ter equal to 18.5 “

It contains of earthy matter 11.66 “

And of unvolatilizable carbon, 68.54 “

100.00

The coke is of moderate density; the coal undergoes an enlargement in the process of coking, of 100 per cent. The ashes are moderately dense and coherent, of a reddish gray colour. Sulphur was distinctly perceptible in the analysis of this coal.

No. 7. This sample was taken from Uhl's seven feet vein, which, at the point of opening, is 130 feet below the level of Beale's Gap. The coal at this opening was observed to be much discoloured by oxide of iron, and as the specimen analyzed was from a part which had been exposed to the air, it had much of the oxide diffused over the surface, which would otherwise, probably, have exhibited the blueish black colour of the more solid parts of the bed.

The specific gravity of this coal is 1.388		
It lost at 300°	2.7	per ct.
And in addition, at a white heat	16.8	“
It contains of earthy matter	12.06	“
And of unvolatilizable carbon	68.44	“
	<hr/> 100.00	

The ashes are bulky, and of a purplish red colour. The process of coking enlarges the bulk of the coal, in some cases to three times its original amount, its exterior being covered with a red metallic oxide. This coal, like the preceding, gave, near the conclusion of the coking process, distinct evidence of sulphurous acid, resulting, no doubt, from the decomposition of the pyritous matter contained in it.

It will be observed that this coal agrees pretty nearly in character with No. 6, with which it may indeed be found to correspond in geological position.

No. 8, is a specimen from Weller's four feet vein; and the opening from which it was taken is 451 feet below the level of Beale's Gap, or 320 feet below that of the last mentioned bed. Between these two levels no beds are known to have been worked; though at least two separate beds have been traced; one at 196, and the other, of 274 feet below the level of Beale's Gap.

The coal from Weller's opening is of a deep

black colour, columnar structure, brilliant in its cross fracture, and of a dull black in the natural horizontal partings, unless where an efflorescence of sulphate of iron from decomposed pyrites, has given a white film to these surfaces.

This coal has a specific gravity of 1.321		
It loses at 300°	1.4	per ct.
And by coking at a white heat, loses		
in addition	18.5	“
It contains of earthy matter and		
oxides	11.0	“
And of carbon not volatilized by		
heat alone	69.1	“
	<hr/>	
	100.00	

The ashes are of a blackish gray colour, with a faint trace of redness observable. The coke is rather more than double the bulk of the coal, is of a steel colour, and rather tender and friable in its consistency. Sulphurous acid is disengaged during the process; and a small quantity of peroxide of iron shows itself, resulting from the decomposition of the sulphate, or of the sulphuret of that metal.

The horizontal distance from this coal opening to that below the church is 1000 feet, and the descent in that distance is 96 feet; so that an inclined plane, with a slope of about one in ten, would convey this coal to a rail-road terminating near the Church land opening. It is probable that a location may be selected for such a plane, of

which the length would be one or two hundred feet less than that above stated.

No. 9. This coal is from the "Church land vein," so called, and is found at 548 feet below the level of Beale's Gap, and 557 feet above the mouth of Jennings's run. The same bed is open on the lands of the company, on the south side of the run, at a short distance lower down the stream.

This coal is of a columnar structure, has a deep black colour; the horizontal plies varying somewhat in brilliancy from each other. The surfaces of superposition are as in the preceding specimen, covered with effloresced sulphate of iron.

The specific gravity is 1.480.

Loss of moisture at 300°	1.2	per ct.
And of bitumen &c. by coking,	17.5	"
The amount of earthy matter is	12.74	"
That of the carbon	68.56	"
	<hr/> 100.00	

The ashes are dense, and of a reddish gray colour. The coke is about double the bulk of the coal from which it is obtained, has an iron gray or reddish exterior, and cakes sufficiently to render it compact.

No. 10. This is from Weller and Hardin's vein, opened on the George Weller tract, 1900

feet in a north-west direction from the Church land vein, near the point where a tributary comes into the north fork of Jennings' run. It is underlaid by a bed of limestone, several feet in thickness, over which that tributary descends for a considerable distance. The coal is of a columnar structure, dull black or iridescent colour, is rather tender and friable in texture, and has a specific gravity of 1.491.

Heated to 300° it loses	1.4	per ct.
Coked at a bright red heat it loses,		
in addition	16.2	“
It contains of earthy impurities	16.04	“
And of carbon	66.36	“
	<hr/>	
	100.00	

The ashes are dense and of a colour nearly flesh red. The coke exceeds the coal from which it is made, by about two-thirds of its original bulk. It has little tendency to cake, and becomes covered on the exterior with a coat of peroxide of iron, from the sulphate decomposed in the coking process. The quantity of earthy matter in this specimen is the greatest of all the samples tried, and the specific gravity, as will be perceived, is also the greatest; and indeed, if we arrange all the coals above reported, in the order of their specific gravities, it will be seen that the quantity of earthy matter in each follows very nearly the same order.

The following table exhibits the coals arranged in the order above suggested.

Coals arranged in the order of their specific gravities, with the proximate constituents of each.

No.	Locality.	Sp. Gr.	Wat. expell. ed at 300°.	Bitu- men.	Ashes.	Car- bon.	Pro. carb to 1 of bitumen.
2	Hoyman's New opening.	1.3195	2.0	18.2	4.05	75.75	4.162
8	Weller's four feet vein.	1.321	1.4	18.5	11.00	69.10	3.735
1	Hoyman's Old bed.	1.3432	1.2	20.6	8.10	69.90	3.393
6	Hoyman's 6 feet bed.	1.362	1.3	18.5	11.66	68.54	3.705
5	Hoyman's 8 feet bed.	1.363	1.1	17.2	10.20	71.50	4.157
4	Schaeffer's new opening.	1.370	1.3	17.5	10.50	70.70	4.040
3	D. Korns's old opening.	1.386	1.4	18.7	11.44	68.46	3.661
7	Uhl's seven-feet vein.	1.388	2.7	16.8	12.06	68.44	4.073
9	Meeting-house vein.	1.480	1.2	17.5	12.79	68.56	3.918
10	Weller and Har- din's.	1.491	1.4	16.2	16.04	66.36	4.096
Mean results.		1.382	1.5	17.97	10.68	69.73	3.894

Omitting the minor fractional divisions, it may be stated that the coal of this formation, contains in 100 parts, by weight, one and a half parts of hygrometric moisture, eighteen of bitumen, ten and

a half earthy matter, and seventy of carbon. It may also be stated in general terms, that the volatile combustible matter bears to the carbon, the proportion of one to four.

The mean specific gravity of the coal being 1.382, the weight of one cubic yard will be 2747 pounds; and each acre of land on which the eight feet bed is found, will accordingly, contain in that bed, 15,800 tons. The six feet bed will contain nearly 11,800 tons per acre.

IRON ORES.

THE variety of iron ores found on the property of the company, their abundance and richness, warrant the highest expectations, as to the value of this district, for iron manufactures. They all belong, in their original condition, to the class of argillaceous carbonates; and though, when observed on or near the surface, they have often been changed to brown hydrates, yet the former is the character under which they must be viewed, when contemplating their application to practical purposes on a large scale. The situations of the several beds of iron ore are various; some being found near the highest part of the formation, as exemplified in the hill north of Henry Heiman's house, and only sixty feet in vertical distance below its summit; others lie below all the beds of coal, and are hitherto

only traced along the outer edges of the trough, near the summits of the Savage and Little Allegheny mountains.

The first iron ore which we encounter in approaching the Savage mountain coal-trough from the south-east, is the fossiliferous ore belonging several hundred feet below the lowest coal. It appears to be analogous to that which is found in various situations from the North and West Branches of the Susquehanna, to the southern borders of the state, near which, I observed it in ascending Gladden's run. It is nowhere in this vicinity explored, that I am aware of, for economical purposes. I had but few opportunities of seeing the ore itself, but the accompanying rocks are so well marked that there is no doubt in my mind that the samples which fell under my notice, are truly portions of the same, or a similar formation.

The next ore in the order of the geological strata, appears to be that which lies almost immediately beneath the conglomerate rock, constituting the general boundary of the coal measures. This ore is exposed near the north branch of Jennings's run, where it passes through Reiber's Gap, and directly in sight of the Somerset turnpike, where the latter crosses the Savage mountain. In the centre of the basin this member of the series must be many hundred feet below the lowest depression of the surface. I am not aware that it

has yet been explored on the Little Allegheny mountain, though I see no reason to doubt that its equivalent at least, will be there found. Reiber has explored two or three bands of ore, each from five to six inches thick, and within six or eight feet of each other. The inclination of the strata here, is 20° towards S. 45° E., and consequently, the strike of the measures conforms to what has been above assigned as the general direction of the trough. This ore has been designated in the series of analysis, as

No. 1. It is very compact in structure, of a bluish grey colour, gives a splintery fracture, and sometimes develops in its surfaces of separation, the existence of vegetable fossils.

Its specific gravity is 3.7644.

At a temperature of 320° Fah. it

loses	1.	per ct.
When strongly calcined, it loses in		
addition	28.4	"
And yields of pig metal	42.2	"
Earthy matter and oxygen	28.4	"
	<hr/>	
	100.	

The iron obtained in this assay was grey, soft, and tough. The mining of this ore would probably be found expensive, at least in the locality above described; but if discovered on the south-eastern side of the trough, the approach to it

would be more convenient, and the mining less expensive.

No. 2. Next in the order of superposition, appears to be the $6\frac{1}{2}$ feet bed of iron ore, in bands and balls, as found near the top of Savage mountain. The sample analyzed was taken from near the bottom of the bed, out of a compact *band* of ore, 12 inches thick. The dip of this bed is, S. 50° E. 17° .

This ore is a light blue impure carbonate, inclining in some parts to reddish brown, owing, probably, to the formation of some peroxide, by exposure to the atmosphere. Its fracture is rough and splintery.

Its specific gravity at 63° Fah. is 3.3957.

Heated to 350° it loses	0.5	per ct.
When calcined at a white heat, it		
loses in addition,	28.0	“
It yields of pig iron,	39.2	“
And contains of earthy impurities,	24.1	“
And of oxygen,	8.2	“
	<hr/>	
	100.	

The pig metal yielded by this ore is dark grey, soft, tough, and exhibits various dark crystalline facets.

The cinder is brittle, opaque, whitish, and abounds in cavities.

No. 3. The next sample of ore analyzed was

from the same bed as the preceding, but was taken from the upper ply or band which is continuous, and about seven inches thick. The fracture of this ore is uneven or splintery; its colour is ashen grey, with brownish red spots near the exterior.

Its specific gravity is 3.077.

Heated to 320° it loses of moisture, 00.5 per ct.

Calcined to whiteness for some time

it parts with water and carbon-		
ic acid to the amount of	20.6	“
It yields of pig metal,	32.8	“
And gives of earthy matter,	37.	“
Of oxygen,	9.1	“
	<hr/>	
	100.00	

The pig metal obtained from this ore is light grey, moderately hard, but tough. The ore will be fully reduced by a flux, consisting of 10 per cent. of its weight of limestone. The cinder is lightish green, and of uniform texture, indicating complete fusion among the earthy ingredients.

No. 4. This was another sample of band ore taken from the mouth of a pit sunk on the bed above described, on the Savage mountain, and presumed to have come from the lower ply, the same as No. 2.

Its fracture is uneven, colour reddish grey internally and brown externally.

Its specific gravity is 3.3179.

Heated to 320° it loses	0.6	per ct.
It loses in addition, by calcination		
at white heat,	24.4	“
And yields of pig metal	36.1	“
Earthy matter,	33.8	“
Volatile matter,	5.1	“
	<hr/> 100.00	

The pig metal of this sample was white and brittle. The cinder, yellowish brown, semi-transparent.

No. 5. This specimen is from the new opening on the Weller tract. Its thickness was not accurately ascertained, as the pit was filled with water at the period of my visit.

Its colour is dark grey, fracture moderately smooth, the decomposed exterior has a coat of ashey grey argillaceous matter.

Its specific gravity is 3.2646.

At 300° it loses in moisture,	0.5	per ct.
At a white heat it sustains an additional loss of	29.5	“
It yields of pig metal	32.3	“
“ of earthy matter,	31.1	“
“ of oxygen and other volatile matter,	6.4	“
	<hr/> 99.8	

The iron yielded in this analysis, was dark grey, soft, and granular; the cinder whitish, and not very smooth or compact.

The elevation of the bed from which the above sample was taken, is about 475 feet below that of Beale's Gap, and 527 below the level of the summit of Hoyman's hill, at the cross-roads. It therefore underlies nearly the whole extent of the company's property, and is everywhere above the water-level of Jennings's run. It appears to be about 20 feet above the level of the *Church-land vein* of coal.

No. 6. This specimen was from the coal opening on the Uhl tract, known as Uhl's upper vein. It lies 44 feet below the level of Beale's Gap, and consequently 421 feet above the last mentioned locality.

The ore has a deep chocolate brown colour, yellow without; it is of a compact texture, but contains occasional cavities, filled with argillaceous matter.

Its specific gravity is 3.4704.

Heated to 320° it loses	4.3	per ct.
At a white heat it loses in addition,	11.5	"
It contains of iron	58.94	"
“ oxygen	25.26	"
	<hr/>	
	100.00	

The ore is reduced at once to metallic malleable iron on the exterior, when in contact with charcoal, at the reducing temperature; and this outer shell contains magnetic oxide of iron, apparently nearly pure.

It seems probable that it would be most advantageously worked with an argillaceous or calcareous ore, containing a larger portion of earthy matter.

This ore is a hydrated peroxide of iron, and is evidently the shell derived from the decomposition of carbonated argillaceous ball ore.

No. 7. This was a sample of the ore from the farm of Cook, senior, found about one mile north or north-easterly from Hoyman's place. It is compact in structure, grey or bluish grey colour, gives a somewhat conchoidal fracture, and has a specific gravity of 3.2764 at 52° Fah.

When heated to 320° it loses	0.5	per ct.
And when calcined to whiteness,		
loses in addition,	30.5	"
It yields of pig metal,	26.7	"
And contains of earthy matter,	29.5	"
,, oxygen	12.8	"
	<hr/>	
	100.	

The reduction is performed with some difficulty, and it is probable that a portion of the oxide escaped decomposition, and passed off with the

cinder. The latter is of a blueish black colour. The thickness of the bed from which this ore was taken, has not hitherto been ascertained, but from my observations I conceive that more than one bed of ore, capable of being profitably worked, may be found on the northerly side of the ridge, between Jennings's and Gladden's runs, on the waters of which latter stream, the farm above mentioned is situated. The iron is dark grey and crystalline.

No. 8. Above the eight feet bed of coal on the Hoyman place, and between it and the upper three feet bed, is a band of iron ore, at an elevation 29 feet above the level of Beale's Gap, and 75 feet above the level of the old drift near which stands the log-cabin occupied by Miller.

This ore is found in a seam of variable thickness, from six inches to one foot, and the outcrop presents some well preserved samples of carbonate, not deeply affected by the atmosphere, but exhibiting merely a thin coating of hydrate.

Its specific gravity at 52° is 3.4069.

It loses at 320°	0.5	per ct.
And at a white heat,	28.4	"
It yields of iron,	35.2	"
Of earthy matter,	28.2	"
Of oxygen,	7.7	"
	<hr/> 100.00	

The iron is a soft mottled grey, fine grained, and tolerably tough. The cinder is easily separated from the metal, and shows internally a dirty green colour.

Tabular view of the iron ores above described.

No.	Locality.	Sp. Gr	Wat. expell- ed at 300°.	Loss by calcina- tion.	Yield in pig metal.	Earthy matter, &c.	Oxy- gen.	Remarks.
1	Reiber's Gap, Savage mount'n.	3.7644	0.1	28.4	42.2	28.4	8.	Iron, grey, soft, tough.
2	Cath. Wyman tract, Sav. mount	3.3957	0.5	28.	39.2	24.1	8.2	Iron, dark grey, soft, tough and crystalline.
3	Upper part of same bed.	3.077	0.5	20.6	32.8	37.	9.1	Iron, light grey, moder- ately hard, but tough.
4	From same tract, but dif. opening.	3.3179	0.6	24.4	36.1	33.8	5.1	Iron, white and brittle.
5	Weller tract new opening.	3.2646	0.5	29.5	32.3	31.1	6.4	Iron, dark grey, soft, granular.
6	Uhl's upper vein.	3.4704	4.3	11.5	58.94		25.26	Iron, malleable.
7	Cook's farm.	3.2764	0.5	30.5	26.7	29.5	12.8	Iron, dark grey, crystal- line.
8	Hoyman's Hill.	3.4069	0.5	28.4	35.2	28.2	7.7	Iron, mottled, fine-grain- ed, tough.
	Mean	3.3716		25.16	37.93	30.3		

From the mean specific gravity of these ores, it appears that one cubic yard will weigh 5685 lbs. or a little more than two and a half tons. It also appears that the average yield in pig metal is a trifle short of 38 per cent. In practice it will probably be safe to calculate on taking three tons of these ores to make one ton of pig iron.

In numbers 1, 2, 4, 5, 7, and 8 of the assays, it is manifest that the iron was almost wholly in the state of a carbonate of the protoxide, since the mean amount of carbonic acid in those six samples was 28.2 per cent., from which the calculated quantity of iron, supposing it to have been proto-carbonate, would be 35.69 per cent.; whereas, it was by experiment, 35.28. The slight deficiency is accounted for, in describing the results of the seventh analysis.

It will be observed that only one of the specimens yielded a white and brittle metal. Indeed, out of many series of assays which I have made on the iron ores from various localities, I do not recollect to have met with a more satisfactory set of results, from any of the carbonated ores of our coal formations.

The valuable bed of ore on the south-easterly slope of the Savage mountain, opened on the Wyman tract, and exhibited in Nos. 2, 3, and 4, of the preceding table, will doubtless be found to extend the whole length of the Adams and Combs tracts, or for a distance of at least two and a

half miles, and with a breadth of more than half a mile. The openings on this ore are at present formed by shafts or pits, sunk to a depth of about 25 or 30 feet. As all the strata here dip in a south-eastwardly direction, and in angles from 16 to 18 degrees, it would not be difficult to approach this important ore bed, by tunnelling across the measures, from a point at some distance below the present opening, and having reached the bed at the lowest convenient level, to run horizontal drifts along the bed, in N. E. and S. W. directions, from which breasts would be worked, upward, north-westwardly, to the outcrop, a distance, probably, of not less than 1000 feet. A tunnel, such as I have just indicated, would cross all the measures between its opening and the ore bed, and would consequently lay open several of those beds of coal which belong to the lower members of the series, not elsewhere approachable on the company's property.

LIMESTONES.

THE possession of an abundant supply of limestone, interstratified with the coal and iron ore beds of the Savage mountain coal-trough, is a circumstance of great interest, in relation, particularly, to the manufacture of iron. These beds are

found at different elevations, and the materials they contain are of variable qualities.

The highest bed of limestone is found on the land of D. Korn, on a tributary of Gladden's run, and at a level of 206 feet lower than that of Beale's Gap. It is particularly noticed at No. 1 of the following table. The thickness of the bed is not well ascertained; and it is not known that the same or an equivalent bed has yet been noticed on the south-easterly side of the ridge. It should be sought for near the level of the coal opening, made in the woods, by order of the president of the company, on the Hoyman tract, and at the left of the road in ascending. It yielded to analysis 38.5 per cent. of pure lime, equivalent to 68.22 of carbonate of lime.

The next limestone of consequence which has been disclosed in the descending order of stratification, is met with at an elevation 327 feet less than that of Beale's Gap. It presents itself near the house of Daniel Uhl, where the outcrop is readily traced.

The colour of this limestone is variable, a part of the bed being ferruginous, and a part nearly destitute of the oxide of iron, as indicated in the analysis presented at Nos. 2 and 3 of the table.

The next lower bed is found on the Weller tract, 490 feet below the level of Beale's Gap, and the quality of the stone is indicated at No. 4 of

the table. This stone appears likely to furnish a suitable flux for some of the ores of iron ; though at the temperature of smelting iron, it was not found to be fusible *per se*.

The 5th and 6th samples of the table are from a bed on the north fork of Jennings's run, which, in one place has a thickness of 15 feet ; the elevation not precisely ascertained, but supposed to be geologically lower than any of the preceding. The bed is of variable qualities as indicated by the analysis, and also by the exterior characters of the stone. A part would probably be found highly useful for making lime ; and the whole may, when properly quarried, furnish a good building stone.

Of the two remaining limestones, (Nos. 7 and 8,) both are found on the south-eastern side of the trough ; the one at an elevation of about 160, and the other, 340 feet below Beale's Gap. The latter of these beds is about nine feet in thickness, and the distance and inclination of the strata, lead to the supposition that it may be the same as is found in Weller's field, (No. 4.) particularly as it is known to be overlaid by a bed of coal, at about the same distance as in the last mentioned locality. The higher of these beds may possibly be the same as that opened on Korn's land, the difference in elevation being attributable to the slope of the measures.

The much greater proportion of insoluble earthy

matter, together with a large dose of metallic oxides renders this latter limestone unsuitable for the ordinary purposes to which lime is applied, and yet may not interfere essentially with its employment as a flux, especially as it is found to yield to heat, even when treated by itself, at a temperature, certainly less than that which is ordinarily required for reducing the ores of iron.

The limestone found at the "Big Spring," in a bed nine feet in thickness, (not included in the following table,) on the Hoyman tract, has a specific gravity of 2.709, yields excellent lime of a yellowish white colour, and by calcination loses 36.4 per cent. of its weight. It shows in many respects a strong analogy with the limestone found on the Weller tract. After calcination, this limestone is completely soluble in acids.

Tabular View of the Series of Limestone examined, with their localities and characters.

No.	Locality.	Description.	Specific gravity.	Wat. lost at 120° C.	Wat. & car. acid exp. by calcina.	Lime.	Insoluble argillaceous matter	Metal. ox. dissolved.	Soluble argillaceous matter.	Remarks.
1	Korns's op. on a br. of Gl. run, bel. a coal se'm	Colour, dark grey, structure, moderately compact, fracture, uneven.	2.6752	0.4	35.0	38.5	Per ct. 12.0	4.0	10.1	The insoluble residuum of this assay, was of an ashen grey colour, and of a harsh, gritty feel.
2	Ferrug. limestone, near Uhl's house.	Colour, internally dark grey, externally, reddish brown, structure, compact, fracture, uneven, splintery.	2.7654	0.2	39.4	28.5	8.5	6.0	17.4	Fully calcined, this stone slakes into a rather crude lime, of a grey colour, indicative of the considerable amount of oxides of iron and manganese.
3	Near Uhl's house, non-ferrugin. portion.	Colour dark ashen grey, with white streaks, structure compact, fracture splintery.	2.7194	0.3	42.5	41.0	3.0	3.0	10.2	This limestone turns, by calcination, into a very good yellowish grey lime, and would probably answer all the purposes of building and iron manufacture.
4	Weller's field, N. E. of turnpike.	Colour dark grey, structure compact, fracture conchoidal uneven.	2.7028	0.3	42.0	41.50	5.5	7.5	3.2	This limestone, when fully calcined, slakes into a grey lime, well adapted to the purposes of building and of agriculture.
5	N. Fork Jennings's run, 15 feet bed.	Colour yellowish grey, structure partly crystalline, fracture splintery.	2.7593	0.3	36.8	19.5	15.5	7.5	20.4	The insoluble residuum is a greyish white argillaceous compound. This stone may be fused by itself at a heat lower than that for smelting iron.
6	Hardin's old coal-bed.	Colour reddish grey, structure amorphous, fracture splintery, conchoidal.	2.7162	0.5	34.74	35.	24.5	1.5	3.76	Insoluble residuum, a white clay. This stone furnishes, after calcination, a grey lime of lighter colour than any of the preceding, and might probably be found useful in building.
7	Point Hill, in Hoym. woods, S. of his lower coal opening.	The structure of this limestone as well as its colour and fracture, strongly resemble the preceding.	2.0818	0.6	31.4	19.	17.	11.5	21.1	This lime slakes but very imperfectly, and would therefore be less suited to the purposes of the arts and of agriculture, than most of the preceding.
8	Spring-house on Hoyman's tract.	Colour dark grey, inclining to black, structure compact, fracture splintery.	2.7577	0.5	36.	30.	13.	8.	12.5	The residuum undissolved, is a greyish white powder, slightly coherent.

Having described the various minerals which appeared most worthy of notice, in consideration of their immediate usefulness, I may add that a series of ancient coal-drifts is seen on the right of Jennings's run, 648 feet below Beale's Gap; and a bed of iron ore is found on the left bank of the same run, below the house of P. Wilhelm, seven hundred and thirteen feet below that level. These must underlie the whole of the company's property, on the north-east side of Jennings's run. Again, at 723 feet below our general level, is a coal opening, between the houses of Miller and Culp, on the right of the run, descending; and at a distance of a few hundred yards above Bluebaugh's house, at the junction of the two forks of Jennings's run, are two lines of old coal workings, 300 yards apart—one on the left, and the other on the right of the run,—and both so near the same level, as to lead to the presumption, that they belong to one and the same bed. They are respectively 808 and 810 feet below our line of departure, and appear to repose almost directly, on the conglomerate bed of the coal formation. The direction from one set of these openings to the other, is almost exactly that which has been assumed as the general longitudinal direction of the coal-trough.

CONNECTION WITH THE PUBLIC WORKS.

THERE are two methods by which the property of the company may be connected with the Chesapeake and Ohio Canal, and with the Baltimore and Ohio Rail-road. The former of these works, will, it is understood, be shortly connected with the mouth of Jennings's run, at which point, a basin is to be constructed; and the latter has been located, from Cumberland, along the valley of Will's creek, around the north-eastern extremity of the Savage mountain coal-trough, and of course passes by the same point.

By inspecting the map herewith submitted, it will be seen that the mouth of Jennings's run is but two and one seventh miles, in horizontal distance, from Beale's Gap, the commencement of my line of survey across the trough; and the profile and section, also accompanying this report, will show that the said gap is 1117.4 feet above the water-level at the mouth of that run. Deducting 17.4 feet for the elevation at which a rail-road might terminate, above water-level in the basin, we should have 1100 feet as the height to be overcome—or rather of descent to be effected—in the distance above mentioned.

Nearly the whole of this distance might be traversed on self-acting inclined planes; and would, consequently, enable the company to take advantage of the natural force of gravitation, for

transporting all their materials thus far on their way to a market.

In running from Beale's Gap to the mouth of Jennings's run, the line of planes would lie wholly within the state of Maryland; but in reaching Will's creek, *within the borders of Pennsylvania*, the direct horizontal distance would be only $1\frac{3}{4}$ miles; but the distance above the mouth of the run, where the state line crosses Will's creek, is about $2\frac{1}{4}$ miles:—so that on the whole the most advantageous route to be pursued in locating planes, would probably be that which lies on the Maryland side of the line.

I have spoken of one mode of approach to the coal field. By an examination of the accompanying geological sections, it will be observed that the level attained by planes such as have been contemplated, is considerably lower than that of many parts of the formation in the cross ridge, between the waters of Jennings's and those of Gladden's run. But a large portion of the formation would still lie many hundred feet below the level in question, and would consequently be unapproached by the method above alluded to.

The most direct course to reach the *whole* of the series of measures, including iron ores, coals and limestones, would doubtless be a tunnel through the Little Allegheny mountain, striking the lower bed of coal, a little above the level of the mouth of Jennings's run. This method of approach,

though, perhaps, too bold and expensive an undertaking for this country and for the present century, would be far less formidable than many works executed for similar purposes, in other countries. It would, either by the direct, or by lateral cuttings, certainly reveal every portion of the strata, and would give advantages to the property on which it should be constructed, which are believed not to be enjoyed on any natural channel by which the minerals of this coal-trough can be reached. But the want of surplus capital in this country may, perhaps, operate for a long time yet to come, in compelling us to resort to cheaper expedients for temporary purposes. The natural channels, formed by the water-courses, must therefore be resorted to, in which to locate rail-roads, for approaching, at least a part, of the minerals of our coal-fields. In examining the two streams which alone are available for these purposes to the Allegheny Coal Company, namely, the Jennings's and the Gladden's runs, I have preferred the former, both on account of its affording the more direct and easy approach, and also, because, if a rail-road be constructed along the Jennings's run, to the forks, and thence up its north branch to the lands of the company, the lower section of $3\frac{1}{2}$ miles, or more than half of the whole distance, would be equally useful for any parties who should be engaged in transporting minerals from the south

fork of the run, which has its sources near Frostburg.

RAIL-ROAD.

WITH the above view of the advantage of an approach through the valley of Jennings's run, I caused a survey and levelling to be made from the lands of the company near Wellersburg, to the mouth of that stream, and found the distance to be 5.8 miles, and the total descent from the level of the Church land vein, so called, to that of the mouth of the run, 560 feet. The whole is divided into sections on the accompanying profile, from which the distances and grade per mile for each section may readily be perceived. It is evident that no power except that of gravitation will be required by the descending loaded trains on any part of the road, and the service of engines will only be needed to draw back the empty cars. It will be perceived, on inspecting the section that the Church land vein, with four or five other workable beds of coal, and with much iron ore and limestone, is wholly above the level of the terminus proposed for the road. No actual location of the rail-road was of course made. All the surveys were intended to be preliminary to more minute investigations hereafter. No curve of a less radius than 1000 feet would probably be required.

COST OF TRANSPORTATION TO MARKET.

ADMITTING that twenty-eight bushels of the coal found on the company's lands make one ton, we shall be able to compute the expense of it at tide-water, by assuming that the actual cost of mining and delivering on the rail-road, is 70 cents per ton, a very large estimate, sufficient to cover the expense of opening, propping, &c., this will be, per bushel, 2.5 cts.

Transportation on the company's rail-road, 5½ miles, to the mouth of Jennings's run, at 3¼ cents per ton per mile, say ¾ cent per bushel for the whole distance,	.75
Wastage and incidental expenses,	.25
Transportation in canal-boats from the mouth of Jennings's run to tide, 189 miles, at 1½ cents per ton per mile, (the expense on the Pennsylvania canals,)	10.1

Makes the whole expense of the coal at tide, 13.6
cts. per bushel=*three dollars and eighty-*
one cents per ton.

The above computations are founded on business transactions in other coal regions, and on the known rates of toll and transport on canals and rail-roads, which have yielded ample profits to the proprietors. The Chesapeake and Ohio Canal has locks 100 feet long and 15 wide, which, as the canal has a depth of 6 feet, will, doubtless, take

boats of at least 100 tons burthen. By a reference to some citations in the Appendix to this report, it will be seen that others have estimated the cost of coal taken at points more remote from Cumberland than are the mines of the Allegheny Coal Company, at somewhat less than I have given it above, but in order to be within limits entirely safe, I have chosen to place the expense fully up to the known practical limits, or even to set some of the items a little above what may be done elsewhere, in order to meet any contingencies which might occur in commencing a new branch of trade in a new locality.

For the last two or three years, bituminous coal has been sold in most of our Atlantic cities, at from seven to eight dollars per ton.—Suppose this to be reduced to six dollars, when the American bituminous coals come into market, this will still leave \$2 19 per ton to pay freight coastwise, and yield the profits of the company:—and supposing present prices to be sustained, there would be left \$3 19, applicable to the same objects. Admitting that the freight from Georgetown to Baltimore, Philadelphia, New York and Boston, should, on an average, be \$1 50 per ton, there would, at the low rate at which I have stated the probable price of coal, be still left 69 cents per ton, as the *value in the ground*, of every ton of coal which could be taken out and brought to market from the company's lands. At this rate, an acre of the eight

feet bed, would alone, after deducting one-seventh for pillars and gangways, be worth \$9,344.67; and as this bed contains but about one-third of all the workable coal above water-level in the centre of the basin, the total value of an acre, without including the lower beds, may be fairly set down at 28,000 dollars.

Though the above computation is founded on a supposed reduction in the price of bituminous coal to six dollars per ton, yet I know of no reason to expect that it will, for many years to come, be reduced to that price. The present price of Virginia coal in the Philadelphia market, is from \$6.75 to 7 dollars per ton, by the cargo.

The adaptation of the situation to the manufacture of iron, appears to be complete. The ore itself is very abundant, and of excellent qualities. The coal is of the class known as "dry bituminous," yielding a moderate per centage only of volatile matter, and a coke which is not so bulky as to choke the furnace, or prevent the application of the raw coal to the manufacture of iron, even without the labour and expense of coking. This remark is not hazarded as a mere conjecture. The coal of this basin, has, within a distance of ten or twelve miles of the company's property, been actually applied to the manufacture of iron, both with and without the process of coking. Having visited the works at Lonakoning, I can bear testimony to the fact, that iron of excellent quality

was made from the ore, coal and limestone found on George's creek, and having before me samples of all the materials used at that locality, I can discover no superiority in them, over those found on the property of the Allegheny Coal Company. To leave no doubt on this subject, particularly with regard to the coal, I analyzed a sample taken from the thick bed, worked near the furnace at Lonakoning, and found it constituted as follows:

Its specific gravity is 1.346.

It contains of moisture and bitumen, 16.03 per ct.

"	of earthy matter,	13.22	"
"	carbon,	70.75	"

100.00

It produces a coke rather more bulky than that of the majority of coals above described. The ashes are nearly of the colour of those of the coal from Hoyman's opening, on the large bed.

To assure myself of the comparative value of coal from an intermediate point, between Lonakoning and the lands of the company, I examined that found at the Eckert mine of the Maryland Mining Company, which gave the following results, viz :

Its specific gravity is 1.437.

It contains of volatile matter, 15.62 per ct.

"	earthy matter,	15.82	"
"	carbon,	68.56	"

100.00

These analyses were made with all the care necessary to insure accurate results. Both these

coals are evidently of the same family, and both are intimately related to those above described. The higher specific gravity of the Eckert mine coal, had, in conformity with a preceding statement, led to the supposition of its containing more earthy matter than that of Lonakoning;—a conjecture fully borne out by the experiment. The iron ore used at Lonakoning, yields, in actual operations, 33 per cent., or a little less, of pig metal. The limestone used is nearly black, and apparently much inferior to that found on the Jennings's run, particularly the nine feet bed found on the Hoyman tract.

The more favourable situation of the lands of the Allegheny Coal Company in regard to transportation, than those in the south-western end of the coal-trough, has already been referred to; and when we take into view the richness and abundance of iron ores, there can hardly be a doubt that the manufacture of iron can be carried on in the Pennsylvania portion of the basin, with at least as much profit as in any other part of this coal field.

Besides the minerals already enumerated, beds of valuable building materials, and seams of fire clay occur at various levels in this coal basin; and owing to the due admixture of lime in the formation, the land is in many parts excellent for agricultural purposes.

I remain, gentlemen, very respectfully,

Your obedient servant,

WALTER R. JOHNSON.

Philadelphia, Feb. 16, 1841.

APPENDIX.

(A.)

*Extract from a Report on the New Map of Maryland, 1836,
by Professor J. T. Ducatel.*

VIEWED transversely, this coal field presents a succession of strata, disposed in a moderate curve, and filling up the valley between the Savage mountain and Dan's mountain, its whole depth being computed at fifteen hundred feet. The inferior strata that are continuous, most probably baset out toward both extremities at a considerable elevation, in the mountains forming the lateral limits of the basin, where they are covered unconformably by strata of millstone grit. The surface of the deposit is irregular, the ravines of the water-courses having penetrated into it to great depths. George's creek, in a distance of thirteen miles and in a longitudinal direction, has scooped out its bed through twelve hundred and fifty feet of perpendicular elevation, carrying away part of the six foot stratum previously mentioned as occurring six hundred feet below the fourteen feet bed, and sinking beneath it to the depth of 220 feet. On the other hand, Jennings's run, in the short distance of six miles, in a direct line, cuts both longitudinally and transversely, through the whole formation, exposing the subjacent red sand-stone. Similar lacerations of the deposit have been produced by the lateral streams, which at some periods of the year act with all the impetuosity of torrents. Moreover, the original irregularities of the surface, that have since determined the direction of the water-courses, as they now appear, were doubtless produced by some more general and powerful excavating cause, that has removed perhaps more than two-thirds of the whole mass, as it existed at its first deposition. That the present irregularities of hill and dale have been occasioned by the partial destruction of the uppermost strata, is made obvious by the fact that the irregularities of the surface do not affect the dip or inclination of those that remain. When they are cut off by the intervention

of a valley, they will be found on the sides of the opposite hills at the some relative levels; showing that the beds had once been continuous. It is important to attend to the extent and direction in which these causes of dispersion in the uppermost strata have acted; because a satisfactory reason is thus obtained for the total disappearance of valuable beds in an intervening place between no very distant spots. The same causes, however, furnish facilities for the exploration of strata that could not otherwise be reached, except at the labour and expense of deep mining operations.

It is worthy of remark, that in the whole of this coal formation, equal in extent to that which has been styled 'the great coal-field of Northumberland and Durham, in England,' there is no reason to expect the occurrence of any *faults*, or dislocations of the strata. These *faults*, so termed, probably from their baffling for a time the pursuit of the miner, consist of deep vertical fissures, usually filled by clay, and including fragments disrupted from the contiguous beds. They are accompanied by a subsidence of the strata on one side, or an elevation of them on the other; so that the same strata are found at different levels on the opposite sides. The change of level occasioned by these dislocations, sometimes exceeds five hundred feet; whence may be inferred the immense violence of the convulsion that had power to produce the displacement of such large masses to so great an extent. It is evident that the absence of such irregularities is a favourable circumstance for the mining operations that will, doubtless before long, be carried on upon an extensive scale, in the Frostburg coal-field.

(B.)

Extract from the Annual Report of the Geologist of Maryland, 1839. By Professor J. T. Ducatel.

The extensive operations that have been carried on at the Lonakoning Iron Works, in Allegheny county, can leave no doubt now that that region of country is abundantly supplied with iron ore, easily obtained, and yielding a very superior metal. Specimens of the pig-iron obtained from this establishment have been forwarded to Baltimore, where they have been already tried with complete success, in various ways, and

the iron left with one of our most ingenious engineers and intelligent artists, (Mr. Winans,) to be subjected to further experiments that cannot fail to establish a character of great excellence to it. Whatever doubts have been expressed, as to the quantity and quality of the ore, have been hastily and indiscreetly, to say the least of them, entertained.

(C.)

Extract from the Third Annual Report on the Geological Survey of the state of Pennsylvania. By H. D. Rogers, State Geologist.

This basin commencing towards the head of Stone run, in Hardy county, Virginia, ranging through Maryland, and terminating at Will's creek, in our own state, is here bounded on the east by the Little Allegheny, and on the south-west [north-west] by the Savage mountain. The Pennsylvanian portion of this basin may be estimated at five miles in width, measured along the State line, and seven in length. It is believed that no coal will be discovered to the north-east of Will's creek, from the close approximation of the bounding ridges, the coal measures have there been much exposed to denudation and carried off. Of the coal veins enclosed within this trough, the highest in the series is that which is principally worked. It extends with a very undulating line of outcrop near the summit of a long irregular ridge of considerable elevation, lying about midway between the Little Allegheny and Savage mountains. Numerous transverse valleys of denudation intersecting the ridge, have interrupted the regular range of this upper coal seam, rendering it difficult to compute the area which it actually occupies, but favouring greatly the operations of the miner, to penetrate it by exposing a more extensive outcrop. Its average thickness, as ascertained in numerous places where it has been opened, is about eight feet, the most extensive mine being that of David [Henry] Hoyman, about a mile north-east of Jennings's run.

The identity of this, with the great seam worked at Frostburg, in Maryland, is highly probable, as well from the character of the coal itself, and the accompanying shales, as from the similarity of its position on the ridge. Several other

good seams are known, situated lower in the series, in thickness from three to five feet, but being less accessible and important than the one above, and there being at present but a small demand for coal in this neighbourhood, except for local use, they have excited but little attention. Iron ore of excellent quality was collected by us on the surface, at many points in the basin, and there is reason to believe will be found in ample quantities especially associated with the shales of the lower seams, whenever the proprietors of the soil shall deem it of sufficient consequence to undertake the requisite diggings. Between the coal seams there occur two or more thin bands of limestone sufficiently abundant to use as a flux or for agricultural purposes.

(D.)

Extract from "A History of the Lehigh Coal and Navigation Company," published by order of the Board of Managers, 1840, p. 50.

The present cost of transportation of coal on the Lehigh and Delaware Canals, including tolls, is one cent, and six-tenths of a cent per ton per mile; and, with a little improvement in the Delaware Canal, this cost can be reduced to one cent, and four-tenths of a cent per ton per mile: more than half of this is tolls or profit to the canals. For this price contracts can be made with boatmen, who furnish one or more boats, as required, with their own crews, horses, &c. These boats, by being decked, would be capable of proceeding to ports on the North or East rivers without transshipment.

(E.)

Extracts from a Report on the probable Revenue of the Chesapeake and Ohio Canal, made to the Baltimore Convention, December, 1834, signed A. Stewart, Chairman, p. 48.

The Committee lay down this position with perfect confidence, *that bituminous coal of superior quality can be delivered on tide-water, for a less sum by this canal, than it can be deliv-*

ered at any other port, on tide-water, in the United States. And if this be true, it follows, as a matter of course, that there will be no limit to the demand, for exportation, but the capacity of the canal to deliver it.

It is a well known fact, that, on the Monongahela river, coal excavated from similar mines, is now delivered at thirteen steam mills and factories, at one cent per bushel. It is presumed it will not cost more, under similar circumstances, to deliver it in a coal boat on the Potomac; but let this sum be doubled, and say that coal in boats will cost two cents 2 cts. per b.

Tolls. The tolls charged on the Pennsylvania

Canal for transportation of coal, is half a cent a ton per mile, which, at 28 bushels per ton, will be nearly

4 cts. per b.

Freight. A boat carrying 1,680 bushels, traveling 2 miles per hour, or 48 miles in 24 hours, (less than the usual speed), will reach tide in $4\frac{1}{2}$ days; it will require, say 2 men, \$2, a boy and horse 75 cents each, making \$3 50 per day, or \$15 75 for the trip, equal to nearly

1 ct. per b.

It is presumed that the returning freight from Washington and the Baltimore rail-road will at least pay expenses, but suppose there be no return loading, charge as above,

1 ct. per b.

Profits. Add for profits \$32 per load, more than 25 per cent. on the whole capital employed,

2 cts. per b.

Total at tide,

10 cts. per b.

But suppose the canal to terminate at Cumberland, (186 miles,) and the coal to be carried $7\frac{1}{2}$ miles on a rail-road, and to cost in the boats $4\frac{1}{2}$ cents instead of 2, as above, difference,

$2\frac{1}{2}$

$12\frac{1}{2}$ cts. per b.

The committee have thus adopted the most liberal allowances, more than they believe will be the actual cost; and they feel confident that the strictest scrutiny into all the elements of the calculation cannot increase the price they have adopted.

If then the bituminous coal from Cumberland can be delivered at tide, for this sum, of course it can be transported coastwise to all our Atlantic ports and towns cheaper than it can

be obtained from any other part of the world ; and if so, can there be any assignable limit to the demand ?

Let us see whether this position is sustained by facts. The cost of transporting coal from Philadelphia to Washington, (as a regular business and not as ballast,) is \$1 50 per ton, or 5 cents per bushel ; to Baltimore, coastwise or by rail-road from Point of Rocks, 4 cents per bushel ; to Boston \$2 per ton, or 7 cents per bushel, and it may be carried to Charleston, or the most distant of our seaports, for 8 cents per bushel, which is more than is received by importers from Liverpool, viz : cost at Liverpool $12\frac{1}{2}$, duties 6 cents ; deduct, also, insurance, commissions, wharfage, &c. from 28 cents per bushel, the price received by them in the American ports, and it leaves less than 8 cents for freight. Apply these facts, and the cost of Cumberland coal will be in our principal cities as follows, viz :

In Washington, Alexandria and Georgetown, (per bushel)

	12½ cents
Present price \$7 per ton or 25	25

	12½
Saving,	12½

In Baltimore it will be 16 cents, viz :

	12½
At Washington,	12½
Freight,	4

	16½
Present price,	25

	8½
Saving,	8½

In Philadelphia it will cost $17\frac{1}{2}$ cents, viz :

	12½
At Washington,	12½
Freight now paid,	5

	17½
The price of bituminous coal is now \$7 per ton, or	25

	7½
Saving,	7½

[At Philadelphia, anthracite is \$5 per ton, or $17\frac{1}{2}$ cents per bushel ; so that the Cumberland will not affect the anthracite, but merely supply the bituminous coal, required for many uses to which the anthracite is inapplicable, viz : gas, coke, smith's shop, steam purposes, &c.]

In Boston it would cost $19\frac{1}{2}$ cents, viz :

	In Washington city,	$12\frac{1}{2}$
	Freight,	7
		<hr/>
		$19\frac{1}{2}$
Present price in Boston \$9 per ton, or (per bushel)		32
		<hr/>
	Saving,	$12\frac{1}{2}$

Thus it appears, from well authenticated facts, collected with great pains, that Cumberland coal can be delivered, coastwise, at all our Atlantic cities and towns, cheaper than it can be obtained from any other part of the United States, or Europe ; and of course the capacity of the canal to furnish it will be the only limit to the supply required.

(F.)

Charter of the Allegheny Coal Company.

SECTION 1. *Be it enacted by the Senate and House of Representatives of the Commonwealth of Pennsylvania, in General Assembly met, and it is hereby enacted by the authority of the same,* That James Armstrong, jr., George Weller, John Mong, Jacob Myers, (G. S.) Samuel W. Pearson, Alexander B. Fleming, Jonathan Knepper, and Daniel Baird, and their associates, successors and assigns, be and they are hereby constituted a body corporate and politic, by the name, style and title of the "Allegheny Coal Company," for the purpose of mining coal, and for the transacting of the usual business of companies engaged in the mining, transporting to market, and selling of coal, and the other products of coal mines. And the said corporation, by the said name, is hereby declared and made capable in law to sue and be sued, to plead and be impleaded, to have a common seal, and the same to alter and renew at pleasure, to make rules and by-laws for the regulation and management of the said corporation, consistent with the laws of the United States, and of this Commonwealth, and generally to do and execute for the well being of said company, whatever shall lawfully pertain to such bodies politic : *Provided,* That nothing herein contained shall be considered as in any

way giving to said company any banking privileges, but they shall be exclusively confined to the operations pertaining to the business aforesaid, according to the true intent and meaning of this act: *And provided also*, That each stockholder shall be liable in his individual capacity for the debts, and performance of all contracts entered into by the said company, to the amount of the balance unpaid on the stock of said company.

SECTION 2. The said company shall have the right to hold either by purchase or lease, not exceeding two thousand acres of land at any one time, the whole to be within the townships of Southampton and Greenville, in the county of Somerset, in the commonwealth of Pennsylvania, and the same, or any part thereof, to sell, or otherwise dispose of, as the interest of the company may require: *Provided*, That the said company may hold, as above, such lot or lots of land, not exceeding five acres, in any one place, as may be found convenient as places of deposit in the transportation and sale of the products of their mines.

SECTION 3. The capital stock of said company shall be and consist of three hundred thousand dollars, and shall be divided into six thousand shares, of fifty dollars each; which capital stock shall only be employed in the holding and purchasing the lands aforesaid, with the improvements, if any thereon, and in constructing such other improvements, buildings, cars, boats, engines, and machinery, as may be necessary or useful for the mining, transportation, and sale of coal, and in the payment of such salaries, wages, and other expenditures, as shall be requisite for the purposes aforesaid, of the company; and the said stock shall be assignable and transferable, according to such rules as the board of directors shall establish.

SECTION 4. When the above named James Armstrong, jr., George Weller, John Mong, Jacob Myers, (G. S.) Samuel W. Pearson, Alexander B. Fleming, Jonathan Knepper, and Daniel Baird, and their associates, shall have subscribed the whole number of shares aforesaid, and actually paid and expended not less than fifteen per cent. of the capital, aforesaid, in purchasing lands, and in such other investments as are authorized by this act for the use of said company, the governor, on due evidence thereof, shall, by letters-patent, under his hand, and the seal of the state, create and erect the said James Armstrong, jr., George Weller, John Mong, Jacob Myers, (G. S.) Samuel W. Pearson, Alexander B. Fleming, Jonathan Knepper, Daniel Baird, and their associates, successors,

and assigns, into one body corporate, by the name, style and title of the "Allegheny Coal Company."

SECTION 5. The affairs of the said company shall be managed by seven directors to be chosen annually from the stockholders. The first election shall be held in the borough of Somerset, county of Somerset, within thirty days after letters-patent aforesaid, shall have been issued, of which election, public notice shall be given by four or more of the corporators named in the first section of this act, at least two weeks prior thereto, in two or more newspapers printed in the county of Somerset, and the subsequent elections shall be held annually, at such convenient time and place as the directors shall determine, of which thirty days previous notice, shall in like manner be given by the president of said company, or by any five of the directors: *Provided*, That in the event of a failure to hold such election, the former directors may continue in office for a period not exceeding six months, or until such election shall be held.

SECTION 6. The election for directors shall be held by ballot, and each stockholder shall be entitled to vote according to the number of shares held by said stockholder, in the proportion following, that is to say; for each share, and not exceeding four shares, one vote; for every two shares above four, and not exceeding ten, one vote; for every four shares above ten, and not exceeding thirty, one vote; for every ten shares above thirty, and not exceeding one hundred, one vote; for every twenty shares above one hundred, one vote. No share shall confer a right of voting which shall not have been transferred at least three calendar months prior to the day of election, nor unless it be bona fide held or owned by the person in whose name it appears, in his own right, or in that of his wife, or for his or her sole use and benefit, or as executor or administrator, trustee or guardian, or in the right or for the use and benefit of some copartnership, society or corporation, of which he or she may be a member. And all votes by proxy, shall be on such terms and conditions as are prescribed by the act passed on the twenty-eighth day of March, one thousand eight hundred and twenty, entitled "an act to regulate proxies."

SECTION 7. The directors shall, as soon as convenient after their election, choose one of their number as president, to serve for one year, they shall also have power to appoint as occasion may require, all other officers and agents of the company, and to supply vacancies in the board arising from death,

resignation or otherwise, until the next annual election. At all meetings of the board, four directors shall form a quorum to transact business.

SECTION 8. The directors may, from time to time, call in on thirty days notice thereof, in at least two newspapers printed in the county of Somerset, such instalments on the stock of said company, as they may judge best, not exceeding twenty per cent. thereof, at any one time and place appointed, and if any instalment of the stock so called in, shall remain unpaid for the space of thirty days after the time so appointed, every such stockholder, or his or her assignee, shall, in addition to the instalment so called for, pay at the rate of two per centum per month, for the delay of such payment, and if the same and additional penalty shall remain unpaid for such space of time, as that the accumulated penalty shall become equal to the sums before paid in part and on account of such shares, the same shall be forfeited to the said company, and may be sold to any person or persons willing to purchase for such prices as can be obtained for the same, or in default of payment by any stockholder of any such instalment as aforesaid, the president and directors may, at their election, cause suit to be brought before an alderman or justice of the peace, or in any court having competent jurisdiction, for the recovery of the same, together with the penalty aforesaid. *Provided*, That no stockholder, whether an original subscriber or assignee, shall be entitled to vote at any election or at any general or special meeting of the said company, on whose share or shares any instalments or arrearages may be due and payable more than thirty days previously to the said election or meeting.

SECTION 9. Dividends of so much of the profits of the company, as shall appear to the directors advisable, shall be declared twice a year, and paid to the stockholders or their legal representatives on demand, at any time after the expiration of ten days after having been declared, but said dividends shall in no case exceed the amount of net profits actually acquired by the company, so that the capital stock shall never thereby be impaired, and if any dividend shall be declared which shall impair the capital stock of the said company, the directors consenting thereto shall be liable in their individual capacities to said company, for the amount of the stock so divided, and each director present when such dividend shall be declared, shall be adjudged consenting thereto, unless he shall forthwith give public notice to the stockholders of the declaring of such dividend. *Provided*, That whenever the dividends shall exceed six per

cent. per annum, the said company shall pay a tax of eight per cent. on all such dividends into the treasury of the state, for the purposes of education, and the president of said company shall annually in the month of January, transmit to the legislature under oath or affirmation, a statement of the receipts and expenditures thereof, and of any dividends which may have been declared during the preceding year.

SECTION 10. It shall not be lawful for the said president, directors and company, nor any of their agents, nor any other person whatever employed by or under them, or any of them, for the purpose contemplated in this act, to enter upon any land which they shall deem necessary for the construction and completion of the said rail-road or rail-roads, or any part thereof, either by the making of any excavation or embankments, or for the mere purpose of searching for stone, earth or gravel, or for the felling of timber for the construction and completion of the said road or roads, until the rate of compensation for injury sustained or to be sustained by reason of the construction thereof, shall have been previously ascertained and paid, or the amount thereof secured in such a manner as shall prove satisfactory to the owner or owners of such land, which said compensation if the parties cannot agree thereon, shall be ascertained in the same manner as is prescribed and provided for in the fifteenth section of the act of the sixth day of April, one thousand eight hundred and thirty, incorporating the Middleport and Pine Creek Rail-road Company.

SECTION 11. Any legal process served on any agent or manager of said company, is hereby declared to be to all intents and purposes as valid as the same would have been if served on the president and directors thereof.

SECTION 12. The company hereby incorporated shall have power to construct rail-roads with one or more tracts from any point or points on their land, to the Maryland line, in the direction of Cumberland. Said company shall have the same powers and immunities, and be subject to the same terms and conditions that are provided for in the act to incorporate the Beaver Meadow Rail-road and Canal Company, and the supplements thereto. *Provided*, That the said company shall not prevent any person or persons, company or companies, hereafter incorporated, being the owner or owners of land bordering on the said rail-road or rail-roads, or adjacent thereto from making lateral rail-roads, and to connect them with said rail-road or rail-roads, from their said lands, as the said person or persons, company or companies, may conceive necessary for

the purpose of transporting their coal or produce upon said railroad or rail-roads, subject to the payment of the same rates of toll now charged by the Minehill and Schuylkill Haven railroad, by virtue of the sixth section of the supplement of their act of incorporation, passed on the twenty-third day of March, one thousand eight hundred and thirty-two, and that the turn-outs for such lateral roads shall be so constructed and kept as not to interfere with the use of the main road or roads, and all cars or wagons run upon the same, shall be subject to such rules and regulations as may be prescribed by the company, and be intended to keep the track of said road or roads, free and open for the uninterrupted passage of the cars of every person desiring to travel thereon.

SECTION 13. This act shall continue and be in force until the first day of May, in the year of our Lord, one thousand eight hundred and sixty-five. *Provided*, That it shall be lawful for the legislature at any time, to amend or repeal any of the foregoing provisions, and to rescind the powers hereby granted, in such manner however, that no injury may be done to the coporators.

WM. HOPKINS,

Speaker of the House of Representatives.

CHARLES B. PENROSE,

Speaker of the Senate.

APPROVED—This twenty-fifth day of May, A. D. eighteen hundred and thirty-nine.

DAVID R. PORTER.

REPORT
OF
AN EXAMINATION OF THE
BEAR VALLEY COAL DISTRICT,
IN DAUPHIN COUNTY, PENNSYLVANIA.

6
4463
BY WALTER R. JOHNSON, A. M.

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PHILADELPHIA.

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1841.

REPORT.

To the President and Directors of the Lykens Valley Coal Co.

THE undersigned having visited the coal district constituting the western fork of the southern anthracite field of Pennsylvania, examined the mines, analyzed the minerals, and observed attentively the facilities for conveying them to market, respectfully states, that this coal district embraces a very large amount of valuable coal land, and is one of the most accessible and most easily wrought, of all our Pennsylvania coal deposits.

It lies between Lykens' Valley on the north and Williams' Valley on the south; these two valleys being bounded, the former, on the north by Mohantango Mountain, and the latter on the south, by Berry's Mountain.

These are termed Red slate valleys, and are rich, productive and extensively cultivated, yielding abundant supplies of agricultural produce suitable for a large mining district.

The coal formation proper is included in an elongated basin or trough, called Bear Valley, situated between two elevated ridges, viz:—Thick Ridge, on the north, dividing it from Lykens' Valley, and Big Lick Ridge, on the south, which separates it from Williams's Valley.

The approach to this valley is through a deep cut or gap in the Big Lick Ridge, called Bear Gap, formed by a creek which comes out of the valley and joins the Wiconisco, by which its waters are conveyed to the Susquehanna river at Millersburg.

This gap extending quite through the southern brim of the trough, and dividing the various beds of which the coal measures are composed, has left the edges, or rather *ends* of the coal seams so exposed, as to be entered by horizontal drifts or gangways, involving no necessity for artificial draining. The coal seams both east and west of the gap, dip northwardly in an angle of about 45 degrees, and hence when the gangways have been driven to the proper extent, the workings commence in an ascending direction, and the coal is delivered to cars in the gangways over shutes formed on the floors of the beds themselves. On some of the beds the breadth of working or breast of coal will not be less than 600 or 800 feet. In others it will probably exceed 1000 feet. This facility of delivering the coal obviates the necessity of handling it after being detached from the solid bed. The mines which I examined were perfectly dry, and more comfortable, therefore, than almost any others which I have visited in the anthracite coal fields.

But besides the facility of mining the coal on the southern side of

the trough by means of the exposure of the ends of beds at the gap, there is the additional advantage of approaching the northern or south-dipping beds by means of a tunnel to be carried horizontally across the beds northwards and through all the interposed strata of slates, sandstones, iron ores, fire clays, &c., and as each successive bed is reached, working right and left by drifts in a manner perfectly analogous to that which is now pursued at the gap.

The openings on these south-dipping beds, on the property of the Lykens' Valley Coal Company, at different heights on the slope of the ridge, have disclosed the fact that in numerous beds good coal is found even at a very few feet from the surface, with roofs and floors of adequate consistence to allow of mining to within a few yards of the outcrop.

If all the beds of the formation, known to be 80 feet in aggregate thickness, lay in a horizontal position, a single acre of land in which they were so situated would contain 129,066 cubic yards, or the same number of tons of coal; and if the same thickness of coal in a single bed or succession of beds were inclined at an angle of 45 degrees, the quantity of coal in an acre would be increased in the proportion of 142 to 100, or it would then be 183,273 tons. All the beds of an inclined formation may be worked on a single acre of land, supposed to extend in a very narrow strip quite across the breadth of the trough, and the whole number of acres may therefore be considered as possessing like advantages over the same number of acres, of which the strata should be supposed horizontal. Now 370 acres of the company's lands lie in a broad belt stretching directly across the coal measures, and embrace as well those parts of the beds which lie below water level, as those which in the two mountain ridges rise up several hundred feet above that level. In these 370 acres there would be found by the preceding computation $183273 \times 370 = 56,268,010$ tons of coal. Admitting that from denudation and other causes only one 10th as much coal shall ever be obtained, the yield of this small portion of the lands will be 5,626,801 tons, or such an amount that if 50,000 tons per annum were taken out, a century would be far from exhausting this limited part of the company's domain.

Thus enough is already known respecting the number and thickness of beds of coal on the lands of the Lykens Valley Coal Company to assure us that a long series of years, must with all the force which can be applied to it, be required to exhaust the coal on a single tract.

The present workings have hardly passed the threshold of the formation—and are in the thinner and less valuable beds, as all observation and experience tend to demonstrate. Even on the Gap tract, so called, many of the more important beds of the formation remain yet to be explored.

The following sketch (page 6) exhibits the inclination, thickness and distance apart of the beds in Thick Ridge, as observed and carefully measured at Raush Gap, and confirmed by numerous openings opposite to Bear Gap. For this sketch I am indebted to Mr. P. W.

Schaeffer, who prepared it from actual measurements. The dip is south 8 or 10 degrees east, about 40 degrees.

From this sketch it appears that the total thickness of coal in the formation is not less than 80 feet on the north side of the trough, (and the same will doubtless apply to the south ridge,) and that more than two thirds of this thickness, is found in seven beds lying in the inner or *upper* portion of the formation, and within a space of 130 yards measured horizontally across the strata. The openings at Bear Gap demonstrate the same general feature. Hence it is confidently believed that in a distance of two hundred yards, at most, all these beds will be reached by the tunnel above proposed, if commenced in the most favourable situation.

The tunnel might be 12 feet wide and 7 high, and its execution might be progressive as new beds were required to be opened. The cost of excavation could not, I judge, in the materials here found, exceed 10 dollars per lineal foot, for the first 200 yards.

In the beds to be reached by this tunnel, coal could be mined for 50 cents per ton, agreeably to the estimate of Mr. Schaeffer, who has been long conversant with the operations in this coal field.

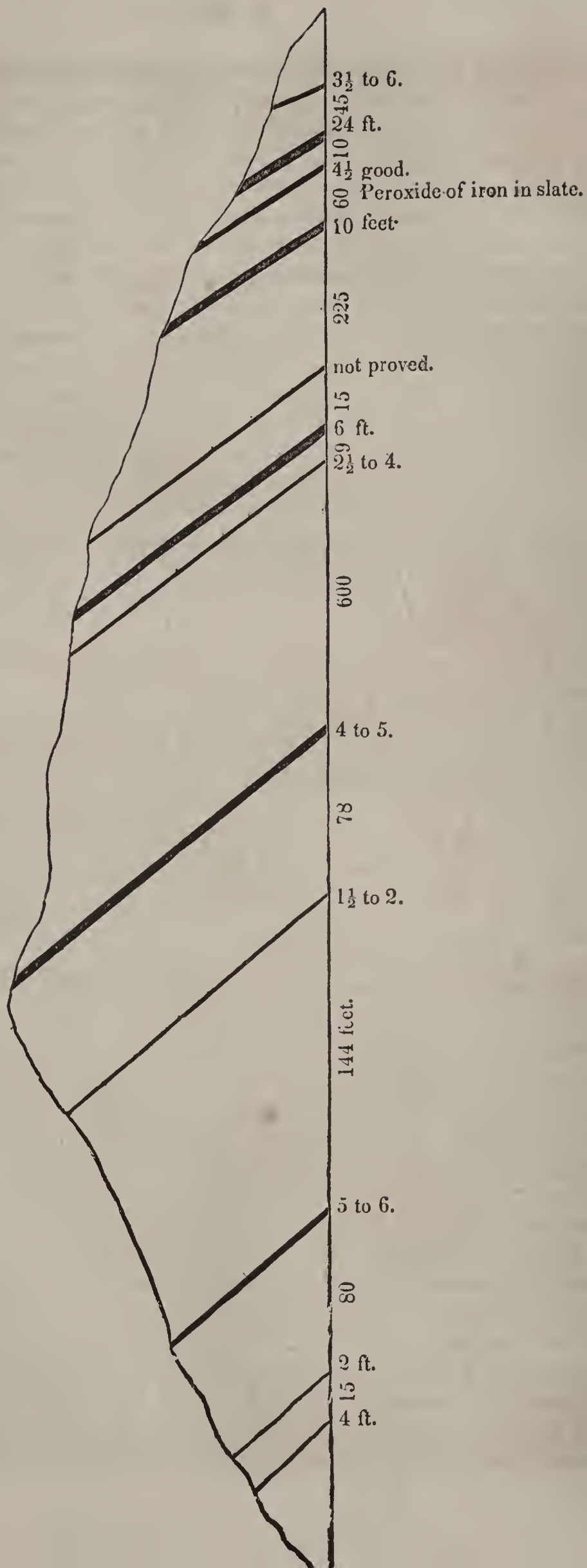
Means of Transportation.

The distance from the point where I propose that this tunnel shall be commenced, to the Susquehanna river, is 16 miles, traversed by the Lykens Valley Rail Road. The superstructure of this road requires to be renewed with T rails, fit to bear transportation by locomotives, and the grading on one section to be altered so as to render the whole line either level or descending in the direction of the freight. This alteration will likewise improve the *plan* of the road, removing or diminishing several curves, and with these changes, it will, I conceive, be made one of the best rail roads for descending tonnage in the coal regions of Pennsylvania. It terminates on the river at the mouth of Wiconisco creek, and at the commencement of the Wiconisco canal. This canal is now nearly completed, requiring only one or two aqueducts and two or three locks to be made, with unimportant excavations to be finished, to place it in a condition to receive the water. Of an original estimate of 416,000 dollars for making this canal, \$364,500 have already been expended, leaving only a balance of 51,500 dollars required to complete the work. For this comparatively trifling sum, it is not to be supposed that the state will forego the advantage of receiving the great amount of tolls which this mineral region can bring, not only to the Wiconisco, but also to the whole line of state canal from Millersburg to Columbia, a distance of 53 miles.

The coal will reach tide water at Havre de Grace, 98½ miles from Millersburg, where it will have cost, agreeably to an estimate by Mr. Schaeffer, (which seems to me ample for every item of the expense, at least in the aggregate,) the sum of \$3 12½ per ton.

Section in Thick Mountain, East side of Rausch Gap.

P. W. SCHAEFFER.



The boats used on this line of navigation will carry 65 tons, and being covered over with suitable hatches, may be towed to Baltimore, in which case the coal delivered on the wharves need not cost over \$3.50 per ton.

Cost of Coal at Tide Water.

The following estimates have been made by Mr. Henry Shaeffer, of Wiconisco, of the expense of mining and delivering coal from the Lykens Valley Coal Company's mines at Bear Gap, to Havre de Grace and to Baltimore, supposing the Wiconisco canal finished, the rail road renewed with edge rails, and the tunnel opened into the north slope of the valley opposite to the forks.

	Per ton.
"1. Mining and delivering at the mouth of the tunnel,	\$0 50
2. Screening and loading into cars,	12 $\frac{1}{2}$
3. Tolls on the rail road 16 miles at 1 $\frac{1}{2}$ cts. per ton per m.	24
4. Motive power on do.	26
5. Use of cars, attendance, oil, and contingencies,	37 $\frac{1}{2}$
6. Putting on board boats at Millersburg,	12 $\frac{1}{2}$
7. Freight on 98 $\frac{1}{2}$ miles of canal at $\frac{3}{4}$ ct. per ton per m.	75
8. Tolls on do. at $\frac{1}{2}$ ct. per ton per mile, say	50
9. Contingencies and waste,	25
<hr/>	
Cost of coal in the boats at Havre de Grace,	3 12 $\frac{1}{2}$
Towing to Baltimore,	25
Handling and stacking,	12 $\frac{1}{2}$
<hr/>	
Cost at Baltimore,	\$3 50"

On the above, I would remark, that the 3d, 4th and 5th items, making up the cost of transportation on 16 miles of rail road, amount to 87 $\frac{1}{2}$ cents per ton, while at Shamokin the transportation over a flat-bar rail road is done by contract with the rail road company, they finding cars, attendance, and every other expense, for 60 cents, over a distance of 19 miles, or a trifle over 3 cts. per ton per mile, including tolls; while Mr. Schaeffer's estimate makes it 5 $\frac{1}{2}$ cts. per ton per mile. I will allow that on the Lykens Valley rail road, the cost *may* be, on 16 miles, a little more than on the 19 at Shamokin, and will suppose it 62 $\frac{1}{2}$ cents per ton, in order to be sure to cover the whole expense. This is 3 $\frac{7}{8}$ cents per ton per mile. This will leave 25 cents to be added to his estimate of the cost of *freight* and *toll* on the canal, which I think requires this addition—making the cost of both items 1 $\frac{52}{100}$ cents per ton per mile; which, in boats carrying 65 tons, is certainly a liberal allowance.

The cost of one handling will be saved by screening the coal at the mouth of the tunnel over several successive screens, separating

the different sizes and loading the cars directly from the screens. This will save at least a part of charge No. 2 in Mr. Schaeffer's estimate. The loading into boats at Millersburg, (No. 6) is, I consider, charged too high at least if it be not intended to cover the waste as well as the handling.

These deductions from other items, being 8 cents, added to No. 9, making in all 33 cents per ton for waste, I judge the latter will be fully adequate to cover that part of the cost. It is obviously unimportant to the land-owner how the items of expense are adjusted, but it may be proper to notice that the rail road proposed to be renewed is not likely to cost more for freight over it, than similar roads elsewhere. Though differing slightly in the particulars, it will be seen that I consider the total cost stated by Mr. Schaeffer to be entirely safe and practical.

Market for Coal.

The city of Baltimore is already the market of considerable quantities of anthracite, and no doubt the consumption there will augment, as the increasing demands of the arts and of steam navigation must put, annually more and more into requisition. The city of Washington likewise requires for domestic purposes no inconsiderable supply. And if, as is confidently expected, anthracite should be adopted as fuel for our naval steamers, the Chesapeake will naturally require a depot of the article, and that which comes most readily to its waters will be able to afford the supply on most advantageous terms.

But let us recur to some facts which prove what are the chances of this coal making its way in eastern markets. This will best be seen by recurring to what the Philadelphia market has hitherto been able to furnish coal for, and comparing the cost there by the cargo with the cost of Lyken's Valley coal at Havre de Grace and at Baltimore.

In order to judge of the probable effect of variations in price of coal on the success of this company and the chances of its operations being at any time suspended for want of an adequate profit to justify the prosecution of its works, an examination has been made to ascertain the price of coal by the cargo at Philadelphia during the month of October of each year for eight or nine years, from 1831 to 1841, only two years being omitted, viz. 1833 and 1837, of which the records were not at hand. From this examination it appears that the average price of coal on the Schuylkill was as follows, viz. :—

In Oct. 1831,	from	\$4 50	to	\$5 00	mean	\$4 75
1832,	"	6 50	"	7 00	"	6 75
1834,	"	4 50	"	5 00	"	4 75
1835,	"	4 75	"	5 25	"	5 00

In Oct. 1836,	from	\$6 50	to	\$7 00	mean	\$6 75
1838,	"	5 00	"	5 50	"	5 25
1839,	"	4 75	"	5 50	"	5 12½
1840,	"	5 00	"	5 50	"	5 25
In Aug. 1841,	it is from	5 25	"	5 50	"	5 37½

Mean average 5 44

It appears that the lowest point reached was \$4 75 per ton in 1831 and 1834; while the average price for the nine years has been \$5 44. Since the city of Baltimore is about as easily reached as Philadelphia by vessels from eastern ports, there is no reason to doubt that coal will be taken from the former city to Boston or New York, if not for the *same* price, at least for no considerable advance on the price of freights paid from the latter. Hence the profit on coal at Baltimore in the most unfavourable times will be $4\ 75 - 3\ 50 = 1\ 25$; or say *one dollar* per ton, while, according to the *average* price, the profit will be $5\ 44 - 3\ 50 = 1\ 94$, say 1 69; deducting in each case 25 cents per ton for the increase of distance in going to Baltimore instead of Philadelphia.

Admitting the justness of the preceding calculations, and that the operations of the company should in one year reach only 50,000 tons, there would be a clear profit of 50,000 dollars in the most unfavourable seasons, and 84,500 dollars in the average times of the coal trade supposed to remain as heretofore in regard to prices. There is very little reason to expect that prices will again fall below \$5 per ton.

Character of Lykens Valley Coal.

This coal is of the variety generally known in commerce as free burning red ash coal. It enjoys already a high reputation for giving, when used for domestic purposes, a steady but lively heat, and yielding little earthy residuum. It is also highly esteemed by smiths and founders; and not less so by those who have applied it to the production of steam, the burning of lime, and the smelting of iron.

The exterior characters of the coal of different beds are somewhat various; and it is not a little remarkable that the kind most sought after by blacksmiths, is that which at first sight might seem the most unpromising, being often covered almost entirely with a coat of yellowish or red oxide of iron, from which it has received the name of the "rusty vein." In other beds the coal is of the clearest jet black, and presents the varieties of tint, dull and bright, due to a greater or less intermixture of mineral charcoal with the pure anthracite.

The following analyses of this coal, with the subsequent comparison between it and the Welsh anthracite used by Mr. Crane, may be interesting in view of its applicability to iron manufactures.

Tabular view of the Analyses of nine samples of Anthracite from the mines of the Lykens Valley Coal Company.

No. of the sample.	Specific gravity.	Water expelled at 320°.	Volatile matter lost at redness.	Fixed Carbon.	Earthy residue.	Exterior and other characters of coal.	Character of ashes.
1	1.391	1.460	6.140	87.950	4.450	Deep black—fracture irregular, shining—or dull from intermixture of charcoal—of which the structure is distinctly seen—and which is soft—sectile and easily combustible—gives out gas, but does not change form on being ignited.	Colour deep brown—inclining to reddish brown—light—little coherent, moderately gritty.
2	1.404	1.390	4.56	89.300	4.750	Brownish black—iridescent or steel blue—surface shining and striated—woody structure of the mineral charcoal seen as above—gas burns brightly.	Light fawn colour, moderately gritty—lights—lightly coherent.
3	1.416	0.70	9.30	85.700	4.300	Lustre silky on a carbonaceous ground—mixture of mineral charcoal in certain parts, with a coke-like mass.	Brownish buff—slightly coherent.
4	1.374	1.10	3.50	88.700	6.700	Very similar to the preceding.	Brownish—dirty red, with slight tinge of purple—very slightly coherent—incineration probably not quite complete.
5	1.376	0.88	7.47	87.750	3.900	Colour deep black—fracture uneven with appearances of coke or charcoal.	Yellowish red—inclining to brown—dense—coherent.
6	1.395	0.90	7.40	88.650	3.050	This sample is less marked with carbonaceous deposits than the preceding—a purplish red tint marks some of the partings, or cross cleats.	Colour deep fawn gritty—heavy coherent.
7	1.382	0.090	7.75	87.200	4.150	Colour deep black—surface shining, striated, silky and occasionally of a dull charcoal lustre—fracture uneven, original grain apparently obliterated by pressure.	Bright fawn—with slight tinge of rose colour, gritty, coherent.
8	1.398	1.314	10.54	83.996	4.150	Appears to resemble certain varieties of bituminous coal in structure, fracture and lustre, with slight specks of pyrites.	Bright buff colour, tolerably coherent—slightly gritty.
9	1.378	1.360	5.94	87.000	5.700	Dull black—surface shining at the fractures which cross the grain of the coal—horizontal seams conspicuous, fine carbonaceous dust seen in the interstices.	Incineration not quite perfect, minute particles of coal perceptible—colour deep fawn.
m'an	1.390	1.111	6.955	87.360	4.572		

The anthracite of Bear Valley is marked with numerous impressions of the vegetable substances from which the coal has been derived. These are not confined to the slates, but penetrate the body of the anthracite itself. The fossils are precisely similar in kind to those found in this and other countries, among the beds of bituminous coal, and correspond perfectly with descriptions already extant; and the minutest characteristic line traced on a bituminous coal slate in Great Britain, France, Germany or South America, has its exact counterpart in the anthracite fields of Pennsylvania. Indeed there can no longer exist a question about the fossils of anthracite and bituminous coals belonging to the same geological period, since we know, that in one and the same coal trough we have perfect anthracite at one end, and perfect bituminous coal at the other with a regular gradation of qualities between them.*

Among the many varieties of anthracite found in Pennsylvania, none, according to my observation, bears a stronger analogy to that of Ynisedwyn in Wales, used at Crane's iron works, than the coal of Lykens Valley.

The first step in tracing this analogy is to mark the relation by external characters.

These, in the Welsh coal, are,

1. A structure often lamellated, and tending to separate at the surfaces of deposition, owing to the quantity of carbonaceous clod which constitutes the dull seams between the bright plies of coal.

2. The abundance and magnitude of reeds and stems constituting the charcoal deposits, traversing the anthracite.

3. The shining and polished surfaces occasionally presenting themselves to view at some of the natural partings.

4. The purplish tints of metallic oxide often observable on the surfaces of fracture.

5. The general colour is deep black, and either dull or shining according as the ply which is examined belongs to the anthracite itself or to the carbonaceous clod partings of the seams.

By observing attentively the external characters described in the 7th column of the preceding table, it will be seen that all the foregoing distinctive marks belong also to the anthracite of the Bear Valley coal field.

The next circumstance worthy of attention in tracing the relation of coals, is their specific gravities. In the Welsh anthracite this is from 1.336 to 1.372, not much greater than that of many bituminous coals. The nine samples of the table above given afford a mean specific gravity of 1.390; the highest being 1.416 and the lowest 1.374.

The quantity of *volatile matter* next deserves notice. Of this, the

* The fossils most frequently observed at Bear Valley are various species of *Filicites Stigmariæ*, *Lepidodendra*, *Calamites*, &c. A specimen of *Stigmaria ficoides* four inches broad was found imbedded in pure anthracite.

Welsh anthracite contains by the mean of *two* trials made by myself,

	9.18 per cent.
of <i>two</i> by Mr. Mushet,	7.23 “
of <i>one</i> by Mr. Frazer,	7.60 “

The mean of these *five* is - - 8.072

The water and *other volatile matter* in my analyses of Lykens Valley coal are separately determined; the mean of water is 1.111, and of other gases, 6.955; the sum of which is 8.066.

The mean quantity of earthy matter in the Welsh anthracite by three of Mr. Mushet's trials is - - 3.578
by one of Mr. Frazer's - - - 5.080

and the average of these two is 4.329

In the Lykens Valley anthracite, the table shows a mean of 4.572.

The quantity of carbon in the coal of Yniscedwyn as deduced from the preceding data is 87.599, while the table shows 87.360 in that of Lykens Valley.

Bringing the preceding statements into a single view the analogy will be perceived at a glance.

	Sp. Gr.	Vol. Mat.	Carbon.	Ashes.
Yniscedwyn coal	1.354	8.072	87.599	4.329
Lykens Valley do.	1.390	8.066	87.360	4.572

If any thing more were wanting to make out the absolute identity of character in these coals, so remote from each other in locality, it would be supplied by the perfect similarity of effects observed to result from their distillation, yielding at first a gas burning with a pale blue flame and afterwards, as the temperature rises, one of strong illuminating power, accompanied by a minute portion of bituminous, condensable matter. The illuminating gas seems to commence suddenly its developement from the Welsh coal, and perhaps also from that of Lykens Valley, but in the latter this circumstance was not particularly noted.

Rich and valuable as are the beds of anthracite in Bear Valley, it will be seen from what follows that these are not the only minerals worthy of consideration, embraced within the district. Like all other known coal formations, it is interspersed with seams of argillaceous carbonate of iron, but as no researches have yet been expressly directed to this object but little more than the outcrop has hitherto been explored.

Iron Ores.

The following analyses of the iron ores found in contiguity with the coal beds of Bear gap, were made in the dry way, and may consequently be regarded as very nearly representing the results

which would be obtained in the process of actual manufacture, except that as the ores were from near the outcrop of the bed they are rather richer in iron than they would have been, if not exposed to the influences of air and moisture.

No. 1. *Species*.—Argillaceous carbonate, passing into hydrated peroxide of iron.

Description.—Form spheroidal; texture, course; colour, from grayish blue to reddish brown.

<i>Specific gravity</i> , at 62° Fahr.	3.40	
Water expelled at 350°	-	2.82 per cent.
Loss by calcination	-	20.87 “
Pig metal obtained	-	42.37 “
Earthy matter	-	21.84 “
Oxygen	-	12.10 “

100.

The pig metal obtained in this assay was moderately hard, amorphous or granular in structure; of a mottled gray colour. The cinder was ash coloured and opaque.

No. 2. *Species*.—Hydrated peroxide of iron—argillaceous.

Description.—Colour, reddish brown; fracture irregular—sectile—splits strongly.

<i>Specific gravity</i> , at 64°	3.347.	
Water expelled at 320°	-	0.89 per cent.
Loss by calcination, chiefly water	-	10.51 “
Yield in pig metal	-	51.35 “
Oxygen	-	22.00 “
Earthy matter	-	15.25 “

100.00

Pig metal moderately hard; structure, fine granular; colour lively grey.

Cinder—a purplish, semi-transparent glass.

No. 3. *Species*.—Nearly the same as the preceding, and probably derived from the same bed.

<i>Specific gravity</i> , at 69°	3.286	
Water lost at 320°	-	1.00 per cent.
Loss by calcination	-	10.13 “
Pig iron	-	51.60 “
Oxygen and earthy impurities	-	37.27 “

100.

Pig metal lively grey, moderately hard, and rather brittle, compact; fracture smooth.

Cinder—a purplish, smoky glass.

No. 4. *Species*.—Argillaceous carbonate of iron, nearly hydrated or transformed into hydrated peroxide of iron.

Description.—Colour, bluish grey; structure, coarse, hard; fracture, uneven, splintery.

<i>Specific gravity</i> , at 61°	3.463		
Water lost at 320°	-	-	14.95
Loss by calcination	-	-	9.92
Pig iron	-	-	51.80
Earthy matter and oxygen	-	-	25.33
			<hr/>
			100.00

The pig metal is compact, but soft; dark mottled; lighter portions ranged in minute pentagonal figures. Cinder, a black glass.

No. 5.—Characters similar to the preceding.

A portion of the exterior shell is sectile; interior, hard.

<i>Specific gravity</i> , at 61°	3.480		
Water lost at 320°	-	-	1.69
Loss by calcination	-	-	10.83
Pig metal obtained	-	-	54.15
Earthy matter	-	-	13.66
Oxygen	-	-	19.63
			<hr/>

100.

Pig metal soft, moderately tough; dark mottled; fracture rough, without signs of crystallization. Cinder, a dark coloured opake glass.

Tabular view of the Analyses of Iron ores of Bear Valley.

Specimen	1	2	3	4	5
Variety of ore.	Argil. Carb. and hyd. perox.	Hyd. oxid.	Hyd. ox.	Argil. carb. and hyd. ox.	Argil. carb.
Sp. Grav.	3.40	3.347	3.286	3.48	3.463
	per cent.	per cent.	per cent.	per cent.	per cent.
Loss by calcining	23.09	11.40	11.13	12.52	14.88
Pig iron	42.37	51.35	51.60	53.05	51.80
Earthy matt'r, &c.	34.54	37.55	37.27	34.43	33.32

The specimens above analyzed are all from near the outcrop of a bed, as indicated by the hydrated shell or crust on the exterior and are therefore richer in iron than the average of the same bed will be, when pursued under a sufficient covering, to yield the blue argillaceous carbonate in its unaltered state. It will then probably range somewhere between 33 and 42 per cent. of metallic iron; give a loss of more than 30 per cent. by calcination, and contain perhaps 25 per cent. of earthy matter.

Stock and property of the Lykens Valley Coal Company.

The stock of the Lykens Valley Coal Company, chartered by the Commonwealth of Pennsylvania, dated July 6th, 1836, consists of six thousand shares at fifty dollars each, the whole of the stock being subscribed and paid for in full.

Additional stock to the amount of \$100,000 has been authorized, by a supplementary act, to be created at the discretion of the president and directors.

The company are empowered to hold 2000 acres of land and the necessary sites for depots.

They are authorized to mine, transport and sell coal and other products of their mines, and invested with all the usual rights and privileges of similar corporations.

The property* of the company consists of about 900 acres of lands in the coal district; a landing at Mount Patrick on the west side of the Susquehanna, where the coal is now delivered to the canal; a farm of 340 acres of land in Williams Valley, $1\frac{1}{4}$ miles above the mines at Bear gap, with good farm house and other buildings; three lots for landings at the mouth of Wiconisco creek, near Millersburg. On one of these lots is a wharf for shipping coal; on another stables, and on the third a dwelling, store, &c.

At the mines they have a town or village called Wiconisco, comprising agent's house and store of brick, a tavern-house and stabling, about 8 or 10 miners' houses, a saw mill, smith's shop, car shops, school house, &c., with lateral rail roads into the mines.

* The following schedule exhibits the quantity of land in each tract, together with the dates of the warrants and names of the warrantees. It will be seen, that with a single exception, the titles have all been derived directly from the commonwealth within the last 16 years, and that the exception referred to, goes no farther back than 1789. Hence there can be no dispute about the titles.

Lands of the Lykens Valley Coal Company, situated in Dauphin County, Pennsylvania.

Acres. Perches.	Warrants and date.
79 70 one undivided 5-8 of 127a. 17p.	F. Linker and others, 11 May, 1825.
25 — one undivided $\frac{1}{2}$ of 50a.	N. Snyder, 15 March, 1825.
185 —	H. Schreiner, 7 Nov. 1825.
196 132	Simon Gratz, 29 June, 1825.
33 152	H. Schreiner, 21 March, 1827.
299 88	H. Schreiner, 3 Aug. 1825.
185 157	H. Schreiner, 29 June, 1825.
131 —	Jacob Albert, 13 Aug. 1789.
37 34	Joel B. Feree, 13 July, 1830.
22 —	John Oundorf, 22 Feb. 1828.
350 — Workman Farm.	

1545 153

Three lots of ground at the mouth of Wiconisco creek, each containing 80 feet front by 200 feet in depth.

The actual quantity of land considerably exceeds that above stated, on account of the allowance always made for roads, in locating warrants, generally exceeding six per cent. on the quantity returned into the surveyor general's office.

The personal property of the company in horses, mules, road and mine cars, canal boats, &c. amounts to about \$13,000.

Annexed to this report, is the act of incorporation, together with its supplement, and a schedule exhibiting a general statement of the affairs of the Lykens' Valley Coal Company, and another presenting a view of its business for the year 1840, made in compliance with the act of incorporation.*

Lykens Valley Rail Road.

Intimately and necessarily connected with the prosperity of every coal region, is the means of conveying its products to market. To secure this for the Lykens' Valley coal, a company was incorporated in 1830, with a capital of \$40,000, which by subsequent acts has been extended to \$400,000, to make a rail road from Millersburg to the mining district.† This road having been for several years in use, has become nearly worn out, owing to the lightness of the iron, which is in the form of flat bars placed on wooden rails.

To renew the superstructure, with edge, T, or trough rails, of suitable weight, to alter the location (so as to avoid a slight ascent now existing on the road in the direction of the transportation,) to prepare the whole road in the most substantial manner for receiving the rails, and to cover engineering, superintendence, and contingencies, the superintendent of the original construction of this road, Simon Salade, Esq., has furnished an estimate founded on his intimate know-

* The following is a list of the present officers of the Lykens Valley Coal Company:

Geo. H. Thomson, President.	
Samuel Richards,	} Directors.
Edward Gratz,	
C. R. Thomson,	
Henry Sheaffer,	
Isaac Prince, Secretary and Treasurer.	

† The following statement exhibits the original cost of the rail road, together with the sources from which the funds were derived for its construction:

Cost of rail road, 15½ miles,	\$69,838 02
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Means by which the road was constructed.

Received for 2025 shares at 20 dollars,	40,500
“ “ 101 “ in part,	942
“ for loans made by Company reimbursable in 1845,	27,871 50
	<hr/>
	\$69,313 50

ledge of the cost of materials and labour, the aggregate of which falls a little short of one hundred thousand dollars.*

The same gentleman has also at my request furnished the following statement of the length, grade, curvatures, and other circumstances of interest in connexion with this road :

“The Lykens Valley Rail Road, is $15\frac{1}{2}$ miles in length, from the mines, and 16 from the forks of Bear creek.—The grades are as follows :

1. $\frac{1}{2}$ mile to old state road, about 5 feet 8 inches in a 100 feet.
2. 1100 feet, 2 feet to the 100 feet, to Wiconisco creek.
3. $3\frac{1}{2}$ miles a dead level.
4. $\frac{1}{2}$ mile at 20 feet to the mile, descent to Kunselman's bridge.
5. About $1\frac{1}{2}$ miles, a rise or ascent of 23 feet to the mile—34 feet in all.
6. $1\frac{1}{4}$ miles a dead level to Sallade's field.
7. 1 mile at 18 feet to the mile—descending.
8. 3 miles at 28 feet to the mile—descending.
9. 4 miles at 42 feet to the mile—descending to the river.

Curvatures.—The shortest curve is in the plane of 900 feet radius. In the 42 feet grade descending is a curve of 1140 feet. In the ascent from the mines to the river there is no curve shorter than 1274 feet. All other curves are about 2400 feet radius. There are but 7 bridges of wood 20 feet span; there are no bridges over the road.

Damages are all satisfied, and the road nearly worn out.

Yours respectfully, SIMON SALLADE.”

July 16th, 1841.

The charter of the Lykens Valley Rail Road will be found in the appendix to this report. One thousand and fifty-six shares of the stock of this company are held by the Lykens Valley Coal Company, valued at \$21,080. This circumstance gives the latter company a preponderating influence in the concerns of the road, and enables it to watch with due care over its condition and management.

In conclusion, I may be allowed to remark, that I know of no other anthracite coal district among the many hitherto brought into active operation, which combines all the advantages, possessed by

* The items of this expense are distributed as follows, viz :

Labour in preparing for and laying superstructure,	\$27,792
Timber for do.	7,587 20
Iron, including rails, plates, and spikes,	58,784
Engineering, superintendence and contingencies,	4,800
	<hr/>
	\$98,963 20

that of Lykens Valley. Its abundant supplies of coal and iron ore, its facilities for mining, the excellence and high repute of its coal, its fortunate connexion with a well located rail road, and at the end of that, with a capacious canal terminating at tide water, and having the Susquehanna river for its supply, and with all the markets both of the south and east accessible during every month in the year from the city of Baltimore, where the main depots of this coal will naturally be made, are circumstances which cannot be overlooked by any one who understands the value of a coal formation, or the innumerable purposes to which its treasures are applied.

I am, gentlemen, very respectfully,

Your obedient servant,

WALTER R. JOHNSON.

NOTE.—The following are the names of the present officers of the Lykens Valley Rail Road Company :

Samuel Richards, President.

Geo. H. Thomson,	}	Directors..
C. R. Thomson,		
Henry Sheaffer,		
Simon Sallade,		
Thomas P. Cope,		
Henry Schreiner,	}	

John Paul, Jr. Secretary and Treasurer

APPENDIX.

ACT OF INCORPORATION.

AN ACT

To incorporate the Lykens Valley Coal Company, in Dauphin county, Pennsylvania, and to authorise the opening of a road in Honesdale, Wayne county.

Section 1. Be it enacted by the Senate and House of Representatives of the Commonwealth of Pennsylvania, in general assembly met, and it is hereby enacted by the authority of the same, That Simon Gratz, Samuel Richards, Henry Sheaffer, George H. Thomson, and Charles Rockland Thomson, and their associates, successors and assignees, be, and they are hereby constituted a body politic and corporate by the name and style of "The Lykens Valley Coal Company, in Dauphin county, Pennsylvania," for the more convenient ownership and working of coal mines in this commonwealth, and the transacting the usual business of companies engaged in the mining, transporting and selling of coal, and the other products of coal mines; and the said corporation by the said name is hereby declared and made capable in law to sue and be sued, to plead and be impleaded, to have a common seal, and the same to alter and renew at pleasure; to make rules and by-laws for the regulation and management of said corporation, consistent with the laws of this commonwealth; and generally to do and execute whatever by law shall appertain to such body politic.

Section 2. The said corporation shall have the right to hold, possess and enjoy, not exceeding two thousand acres of land in the counties of Dauphin and Perry, in the commonwealth of Pennsylvania, and such lot or lots of land, not exceeding four acres in any one place, as may be found convenient as places of deposit, in the transportation and sale of the products of their mines; and that the whole amount of the capital stock shall not exceed in value three hundred thousand dollars; and shall be divided into shares of fifty dollars each share; which capital shall be employed in

purchasing and holding the lands aforesaid, and in constructing buildings, cars, wagons, vessels, boats, and such other improvements and machinery as may be necessary or useful for the mining and transporting of coal, the product of their mines, and for the general purposes of said company. Every member of said company shall have a certificate, under the seal of the corporation, made and attested in such manner and form as the by-laws shall direct, certifying his property in the share or shares owned by him ; and the stock of said company shall, in the nature of personal property, be assignable and transferable according to such rules as the board of directors shall establish ; and no stockholder indebted to the company, shall be permitted to make a transfer, or receive a dividend, until such debt is discharged, or security given for the same, to the satisfaction of the board of directors.

Section 3. When the above named Simon Gratz, Samuel Richards, Henry Sheaffer, George H. Thomson, Charles Rockland Thomson, and their associates, shall have subscribed the whole number of shares aforesaid, and actually paid and expended not less than fifty per cent. in money in purchasing lands, and such other investments as are authorised by the second section of this act for the uses and purposes of said company, the Governor, on evidence thereof, shall by letters-patent, under his hand and seal of the state, create and erect the said Simon Gratz, Samuel Richards, Henry Sheaffer, George H. Thomson, Charles Rockland Thomson, and their associates, successors and assigns, into one body politic and corporate, in deed and in law, by the name, style and title of the " Lykens Valley Coal Company, in Dauphin county, Pennsylvania."

Section 4. The affairs of the company shall be managed by five directors, to be chosen annually, from the stockholders, by the majority of the votes, given either in person or by proxy ; the first election shall be held in the city of Philadelphia, within thirty days after letters-patent shall have issued, of which public notice shall be given by three or more of the stockholders named in the first section of this act, at least two weeks previous in one or more newspapers printed in Philadelphia and Harrisburg ; and the subsequent elections shall be held annually at such convenient time and place as the directors shall appoint, of which previous public notice shall be given by the President of the company at least thirty days.

Section 5. The directors, as soon as conveniently may be after their election, shall meet at such time and place as may be designated by a majority of them, and choose by ballot one of their number for President to serve for one year, or until superseded by a new election ; they shall also have power to appoint other officers and agents to conduct and prosecute the business of said company in such manner as they shall deem necessary and proper ; at all meetings of the board three directors shall form a quorum to transact business ; and minutes of all their proceedings and regular accounts of all their transactions, as well as minutes of the proceedings of the stockholders at each of their meetings shall be duly recorded in books to be kept for those purposes, and shall be exhibited for inspection at all meetings of the stockholders ; and the said directors shall declare and pay annually to the stockholders, or their legal representatives, a dividend of such part of the net profits of said company as to them shall appear advisable and expedient.

Section 6. The directors aforesaid may from time to time, at any meeting assess upon each share of stock such sum of money not exceeding fifteen per cent. as shall be judged necessary for the uses and purposes of the company, to be paid at such time and place and to such persons as said directors may authorise to receive the same ; and if after thirty days public notice, in one or more newspapers printed in the city of Philadelphia, and at least one newspaper printed in Dauphin county, of the time and place of payment of any proportion or instalment of said capital stock, any stockholder shall neglect to pay his instalment, at the time appointed, for thirty days after the time so designated, the amount previously paid may be forfeited to the company, and the stock aforesaid may be sold to any person for such price as can be obtained for the same.

Section 7. The said company shall make an annual report, under oath of the President, to the legislature, and as soon as they shall have made a dividend exceeding fifteen per cent., shall pay an annual tax of eight per cent. on all dividends made above that amount.

Section 8. The legislature reserves the right to revoke, alter or amend the charter hereby granted, at any time hereafter. And provided, That nothing herein contained shall be construed as in any way giving to the said company any banking or trading privileges, or any other privileges but such as are provided by the first section of this act.

Section 9. This act may continue in force for the term of fifteen years from the passage thereof, and no longer, unless the same be sooner repealed in pursuance of the eighth section of this act.

Section 10. That the recorder of deeds for the city and county of Philadelphia be, and he is hereby authorised and required to cause to be made, fair transcripts of all indexes of deeds or mortgages in his said office which may be required to be transcribed, and to complete, as soon as possible, the indexes in arrear in his office ; the expense thereof to be paid by warrants drawn by the county commissioners ; and for the purpose of making the said copies, the said recorder shall have full power to employ and at pleasure dismiss such additional clerks as may have been employed or as he may deem expedient to employ.

Section 11. That for every search hereafter to be made by the said recorder of deeds, he shall be entitled to receive, if the same extends beyond ten years, twenty-five cents, and twenty-five cents for every ten years beyond twenty years.

Section 12. That the select and common councils of the city of Pittsburgh shall have power in determining the location of a street, to be called Duquesne Way, authorised to be located and opened in the said city, by the act to which this is a supplement, to alter the course of the same for the distance contained between the eastern boundary line of the said city and the bridge erected at the end of St. Clair street, in such manner as they shall deem most conducive to the interests of said city.

Section 13. That the public road leading from Cherry Ridge to the borough of Honesdale, from its present termination at the line of said borough to the main street or road near Mrs. Steward's house, is hereby declared a public highway.

Section 14. If the borough authorities of Honesdale shall neglect or refuse to open the said road within six months from the passage of this

act, then and in that case it shall and may be lawful for the supervisors of Dyberry township to open the said road ; the expense of which shall be recovered of the burgess and council of Honesdale, as sums of like amount are now by law recoverable.

Section 15. That the treasurer of the commonwealth be and he is hereby authorised, to pay to Albert I. Kelso, or his order, ninety-seven dollars and eighty-five cents, money overpaid by said Kelso in patenting outlots, numbers four hundred and fourteen, and five hundred and fifteen, adjoining the town of Erie.*

NER MIDDLESWARTH,
Speaker of the House of Representatives.

THOMAS S. CUNNINGHAM,
Speaker of the Senate.

Approved the third day of June, anno domini one thousand eight hundred and thirty-six.

JOS. RITNER.

Secretary's Office, Harrisburg.

[L. s.] I, Francis R. Shunk, Secretary of state in and for the commonwealth of Pennsylvania, do certify that the above and foregoing is a true and exact copy of " An act to incorporate the Lykens Valley Coal Company, in Dauphin county, Pennsylvania, and to authorise the opening of a road in Honesdale, Wayne county," of the original act as the same remains filed in this office.

Witness my hand and the seal of the said office at Harrisburg, this first day of March, in the year of our Lord one thousand eight hundred and thirty-nine, and of the commonwealth the sixty-third.

FR. R. SHUNK,
Secretary Comm'lth.

* It will be perceived that from the 10th section to the end, this act has relation to subjects in no way connected with the Lykens Valley Coal Company.

SUPPLEMENTARY ACT.

AN ACT

Supplementary to an act entitled “ An act authorising the Governor to incorporate the Meadville and Titusville Turnpike Road Company, and for other purposes.”

SECTION 7. That it shall be lawful for the president and directors of the Lykens Valley Coal Company, in Dauphin County, Pennsylvania, at any time when they may deem the same expedient, to enlarge the capital stock of said company, by the sale of any number not exceeding two thousand shares, at the par value of fifty dollars each share, in addition to the stock which the said company are now entitled to hold. And it shall also be lawful for them, from time to time, as they may deem the same necessary, to borrow money for the purposes of the company, for such periods of time and on such terms as they may deem expedient, with authority to sell, mortgage or otherwise dispose of their estate, real, personal and mixed.

LEWIS DEWART,
Speaker of the House of Representatives.

CHARLES B. PENROSE.
Speaker of the Senate.

Approved, the thirteenth day of April, one thousand eight and thirty-eight.

JOS. RITNER.

PENNSYLVANIA, ss.

Secretary's Office.

I, Francis R. Shunk, secretary of the Commonwealth of Pennsylvania, do certify that the within is a true copy of the seventh section of an act entitled “ An act supplementary to an act entitled an act authorizing the governor to incorporate the Meadville and Titusville Turnpike Road Company and for other purposes,” passed the thirteenth day of April, A. D. 1838, of the original, as it remains on file among the records of the said office ; being the only section in said act having any relation to the “ Lykens Valley Coal Company.”

[L. S.] IN TESTIMONY whereof I have hereunto set my hand and affixed the seal of the said office at Harrisburg this first day of March in the year of our Lord one thousand eight hundred and thirty-nine, and of the commonwealth the sixty-third.

FR. R. SHUNK,
Sec'y Com.

In compliance with the act incorporating "The Lykens Valley Coal Company," the following Statements are presented to the Legislature, showing the whole amount of their capital paid into the funds of the Company, the sums expended, and the profits accruing to 31 Dec. 1840.

Statement of the business of the Lykens Valley Coal Company from 1 January, 1840 to 31 Dec. 1840.

Dr.		Cr.	
To coal on hand 31 Dec. 1839, valued at .	\$1,490 00	By sales of coal to 31 Dec. 1840, 5,205 tons	\$15,207 96
" Personal property, rail-road and mine wagons, canal coats, horses, mules, mining tools, &c. per inventory and valuation, on 31 Dec. 1839, .	13,165 00	" Coal on hand 31 Dec. 1840—507 tons, valued at .	910 00
" Mining, freights, labour hire, salaries, interest and incidental expenses—deducting amount received for rent of houses, &c.	9,972 72	" Improvements on real estates per debit side .	694 60
" Improvements on real estate, expended on farms and houses, .	694 60	" Personal property, rail-road and mine wagons, canal boats, horses, mules, mining tools, &c. per inventory and valuation on the 31st Dec. 1840, .	12,965 00
" Tolls to state on coal per canal, .	641 75		
" Tolls to Lykens Valley Rail-road Company on coal, &c. .	1,200 00		
" Boating cars of coal across river at Millersburg, .	856 00		
" Balance to credit of profit and loss, .	1,757 49		
	<u>\$29,777 56</u>		<u>\$29,777 56</u>
		Profit and loss	<u>1,757 49</u>

General Statement of the affairs of the Lykens Valley Coal Company, 31 December, 1840.

Dr.		Cr.	
To capital stock,	\$300,000 00	By real estate at cost,	\$268,176 09
“ Notes payable,	13,407 91	“ Buildings and improvements of real estate,	14,503 00
“ * Bonds and mortgages,	7,000 00	“ Personal property, rail-road and mine wa-	12,965 00
“ Balances due sundry persons	1,382 07	gons, canal boats, horses, mules, mining	
“ Balance to the credit of profit and loss	5,613 11	tools, &c. per inventory and valuation, on	
		the 31st December, 1840.	
		“ Coal on hand 31 Dec. 1840—507 tons, valued	
		at .	910 00
		“ Stock Lykens Valley Rail-road Comp. 1056	
		shares a 20 dollars,	21,080 00
		“ Stock Lykens Valley Coal Comp. 105 shares	
		a 50 dollars,	5,250 00
		“ Balances due by sundry persons for coal, &c.	4,519 00
	\$327,403 09		\$327,403 00
		Profit and loss—balance 31 Dec. 1840,	5,613 11

(25)

City of Philadelphia, ss.

Personally appeared before me, one of the aldermen of the said city, George H. Thomson, President of the Lykens Valley Coal Company, who being duly sworn, doth depose and say, that the above statement of the business of the Lykens Valley Coal Company from 1 January, 1840, to 31 December, 1840, and the general statement of the affairs of the Lykens Valley Coal Company 31 December, 1840, exhibit a just and true statement of the affairs of the said company as they stood on its books on the 31st of December, 1840.

Sworn and subscribed before me, this 28th day of January, 1841.

(Signed) Peter Hay, Alderman.

(Signed)

Geo. H. Thomson,
President.

* Since the date of the above statement the company have sold the farm then owned, at Mount Patrick in Perry county, for \$11,000. The mortgage of \$7000 on that property has therefore been cancelled, and the balance \$4000 applied to the reduction of the amount of notes payable.

ACT OF INCORPORATION.

AN ACT

To incorporate the Lykens Valley Rail Road Company, in Dauphin County.

Section 1. Be it enacted by the Senate and House of Representatives of the commonwealth of Pennsylvania in general assembly met, and it is hereby enacted by the authority of the same, That Henry Shriner, Henry Sheaffer, Simon Sallade, James Buchanan, Samuel France, Daniel L. N. Reutter, of Dauphin county, Simon Gratz and John Barber, of Columbia, Lancaster county, be, and they are hereby appointed commissioners to do and perform the several things hereinafter mentioned, that is to say, they shall on or before the first day of December next, procure a sufficient number of books, and open the same at such times and places as the said commissioners or a majority of them may direct ; in each of which said books they shall enter as follows : “ We whose names are hereunto subscribed, do promise to pay to the President and Managers of the Lykens Valley Rail Road and Coal Company, the sum of twenty dollars for every share of stock set opposite our respective names, in such manner and proportions, and at such times, as shall be determined by the President and Managers of the said company, in pursuance of an act of the general assembly of this commonwealth, entitled “ An act to incorporate the Lykens Valley Rail Road and Coal Company.” Witness our hands the day of in the year of our Lord one thousand eight hundred and ;” and shall thereupon give notice in one or more papers printed in the county of Dauphin, and in one or more papers printed in the city of Philadelphia, twenty days at least, of the times and places when and where the said books shall be kept open and receive subscriptions for the stock of the said company, at which respective times and places one or more of the commissioners shall attend, and permit all persons of lawful age who shall offer to subscribe in the said books, in their own names or in the names of any other person who shall authorise the same, for shares in the said stock, and the said books shall be kept open respectively for the said purpose at least six hours in every juridicial day, for the space of four days, or until there shall have been subscribed one thousand shares ; and if at the expiration of six days, the books aforesaid shall not have the number of shares aforesaid therein subscribed, the said commissioners may adjourn from time to time, and transfer the book or books elsewhere, until the whole number of two thousand shares shall be subscribed ; of which adjournments and transfers the commissioners aforesaid shall give such public notice as the occasion may require ; and when the whole number of shares shall be subscribed, then the books shall be closed : *Provided*, That no person be permitted to subscribe for more than five shares on the first day, and not more than five shares on the second day ; after which any person may subscribe for any number of shares, until the whole of the stock be taken.

Section 2. And be it further enacted by the authority aforesaid, That when five hundred shares or more of the stock shall be subscribed, and the sum of five dollars paid on each and every share, the commissioners, or a majority of them, may certify to the Governor under their hands and seals, the names of the subscribers and the number of shares subscribed by each ; whereupon the Governor shall by letters-patent under his hand and seal of the commonwealth, create and erect the subscribers, and if the subscription be not full at the time, then also those who shall thereafter subscribe, to the number of shares as aforesaid, into a body politic and corporate in deed and in law, by the name, style and title of the “ Lykens Valley Rail Road and Coal Company ;” and by the same name the subscribers shall have perpetual succession, and be able to sue and be sued, plead and be impleaded, in all courts of record and elsewhere ; and to purchase, receive, have, hold, and enjoy to them and their successors, lands, tenements, and hereditaments, goods, chattels, and all estate, real, personal or mixed, of what kind or quality soever ; and the same from time to time to sell, mortgage, grant, alien or dispose of ; and to make dividends of such portions of the profits as they may deem proper, and also to make and have a common seal, and the same to alter or renew at pleasure ; and also to ordain, establish and put in execution such by-laws, ordinances and regulations as shall appear necessary and convenient for the government of the said corporation, not being contrary to the constitution and laws of the United States or of this commonwealth ; and generally to do all and singular the matters and things which to them it shall lawfully appertain to do for the well being of the said corporation, and the due management and ordering the affairs of the same : *Provided*, Nothing herein contained shall be considered as in any way giving to the said corporation any mining, trading or banking privileges whatsoever, or any other liberties, privileges or franchises, but such as may be necessary or incident to the making of the said rail road : *Provided further*, That the said company shall at no time hold or possess any coal land, for the purpose of carrying on the coal trade.

Section 3. And be it further enacted by the authority aforesaid, That the said named persons or a majority of them, shall as soon as conveniently may be after the said letters-patent shall be obtained, give at least twenty days previous notice in the newspapers hereinbefore mentioned, of the time and place by them appointed for the subscribers to meet in order to organize the said company, and to choose by a majority of votes of the said subscribers, by ballot, to be given in person or by proxy, which proxy shall have been obtained and bear date within three months previously to the election at which such proxy shall be presented, duly authorised, one president and seven managers, all of whom shall be residents of this commonwealth, a treasurer and secretary, and such other officers as shall be deemed necessary : that the president and managers aforesaid shall conduct the business of said company until the first Monday of December then next, and until like officers shall be chosen ; and may make such by-laws, rules, orders and regulations as are not inconsistent with the constitution and laws of the United States, or of this state, and that may be necessary for the well governing the affairs of the company.

Section 4. And be it further enacted by the authority aforesaid, That the stockholders shall meet on the first Monday in May in every year, at

such place as may be fixed upon by the by-laws, of which notice shall be given at least twenty days by the secretary, in the newspapers before mentioned, and choose by a majority of votes present their officers for the ensuing year, as mentioned in the third section of this act; who shall continue in office for one year, and until others are chosen; and at such other times as they may be summoned by the managers, in such manner and form as shall be prescribed by the by-laws; at which annual or special meeting they shall have full power and authority to make, alter or repeal, by a majority of the votes, in manner aforesaid, all such by-laws, rules, orders, and regulations as aforesaid, and to do and perform every other corporate act; and the number of votes to which each stockholder shall be entitled, shall be according to the number of shares he or she shall hold, in the proportions following, that is to say: for each share, not exceeding two shares, two votes; for every two shares above two and not exceeding ten shares one vote; for every four shares above ten and not exceeding thirty, one vote; for every ten shares above thirty and not exceeding one hundred, one vote; but no share or number of shares above one hundred as aforesaid, shall confer any additional right of voting, and no share shall confer a right of suffrage which shall not have been holden three calender months prior to the day of election, nor unless it be holden by the person in whose name it appears, absolutely and bona fide, in his own right, or as executor or administrator, trustee or guardian, or in the right or for the use and benefit of some copartnership, corporation or society of which he or she may be a member, and not in trust for and to the use and benefit of any other person: *Provided*, That no shares held by transfer shall be entitled to votes unless the same shall have been transferred at least three months before the election; and all votes by proxy shall be on such terms and conditions as are prescribed by this act.

Section 5. And be it further enacted by the authority aforesaid, That the election for officers provided for in the fourth section of this act, shall be conducted in the following manner; that is to say: the managers for the time being shall appoint two of the stockholders not being managers, to be judges of the said election, and to conduct the same after having severally sworn and subscribed an oath or affirmation, before an alderman or justice of the peace, well and truly and according to law to conduct said election, to the best of their knowledge and abilities; and the said judges shall decide upon the qualifications of the voters; and when the election is closed, shall count the votes and declare who has been elected; and if it shall at any time happen that an election of president, managers, treasurer, secretary or other officers shall not be made, the corporation shall not for that cause be deemed to be dissolved, but it shall be lawful to hold and make such election of president, managers, treasurer, secretary or other officer on the same day, or at any other day thereafter, by giving at least ten days notice, signed by the president or secretary, in the newspapers before mentioned, of the time and place of holding said election; and the president, managers, treasurer, secretary, and other officers of the preceding year shall in that case continue to act, and be invested with all the powers belonging to their respective situations, until an election shall take place. In the case of death, resignation, or removal from the state of any president, manager, treasurer, secretary, or other officer, his place shall be filled by the board of managers until the next annual election.

Section 6. And be it further enacted by the authority aforesaid, That said president and managers shall meet at such times and places as shall be found most convenient for the transacting of their business ; and when met four shall be a quorum, who, in the absence of the president, may choose a chairman, and shall keep minutes of their transactions fairly entered in a book ; and a quorum being formed, they shall have full power and authority to appoint all such surveyors, engineers, superintendents, and other artists and officers as they shall deem necessary to carry on the intended work, and to fix their salaries and wages, to ascertain the times, manner and proportions in which the said stockholders shall pay the moneys due on the respective shares ; to draw orders on the treasurer for money, which shall be signed by the president, or in his absence by a majority of the managers present, and countersigned by the secretary ; and generally to do all such other acts, matters and things as by this act and by the by-laws and regulations of the company they are authorised to do.

Section 7. And be it further enacted by the authority aforesaid, That the president and managers first chosen shall procure certificates or evidence of stock, for all the shares of the said company, and shall deliver one such certificate, signed by the president, and countersigned by the treasurer and sealed with the common seal of the said corporation, to each person, for every share by him subscribed and held, which certificate or evidence of stock shall be transferable at his pleasure, in person or by attorney, duly authorised, in the presence of the president, who shall keep a book for that purpose, subject however to all payments due or to become due thereon ; and the assignee holding any certificate having first caused the assignment to be entered in a book of the company to be kept for the transfer of stock, shall be a member of the said corporation, and for every certificate assigned to him as aforesaid, shall be entitled to one share of the capital stock, of all the estates and emoluments of the company incident to one share, and to vote as aforesaid at the meeting thereof, and subject to all penalties and forfeitures, and of being sued for all the balance and penalty due or to become due on each share, as the original subscriber would have been.

Section 8. And be it further enacted by the authority aforesaid, That if after thirty days notice in the public papers aforesaid, of the time and place appointed for the payment of any proportion or instalment of the said capital stock, in order to carry on the work, any stockholder shall neglect to pay such proportion or instalment at the place appointed for the space of thirty days after the time so appointed, every such stockholder or his assignee shall, in addition to the instalment so called for, pay at the rate of two per centum per month for the delay of such payment ; and if the same and additional penalty shall remain unpaid for such space of time, as that the accumulated penalty shall become equal to the sums before paid in part and on account of such shares, the same shall be forfeited to the said company, and may be sold to any person or persons willing to purchase, for such price as can be obtained for the same ; or in default of payment by any stockholder, of any such instalment as aforesaid, the president and managers may at their election cause suit to be brought before an alderman or justice of the peace, or in any court having competent jurisdiction, for the recovery of the same, together with the penalty aforesaid : *Provided*, That no stockholder, whether original subscriber or

assignee, shall be entitled to vote at any election, or at any general or special meeting of the said company, on whose share or shares any installment or arrearages may be due and payable more than thirty days previously to the said election or meeting.

Section 9. And be it further enacted by the authority aforesaid, That the president and managers of the said company shall demand and require of and from the treasurer and all and every other the officers and other persons by them employed, bond in sufficient penalties, and with such securities, as they shall by their rules, orders and regulations require, for the faithful discharge of the several duties and trusts to them, or any of them, respectively committed.

Section 10. And be it further enacted by the authority aforesaid, That dividends of so much of the profits of the institution as shall appear advisable to the directors, shall be declared at least twice a year in every year, and paid to the stockholders on demand at any time after the expiration of ten days therefrom, but they shall in no case exceed the amounts of the net profits actually required by the company, so that the capital stock shall never be thereby impaired ; if the said directors shall make any dividend which shall impair the capital stock of said institution, the directors consenting thereto shall be liable in their individual capacities to said company for the amount of the stock so divided ; and each director present when such dividends shall be declared, shall be adjudged to be consenting thereto, unless he forthwith enter his protest in the minutes of the board ; and give public notice to the stockholders at the declaring of such dividend ; *Provided*, No dividend shall exceed twelve per centum per annum.

Section 11. And be it further enacted by the authority aforesaid, That at the end of the third year after the date of this incorporation, and at the end of every year thereafter, there shall be furnished to the legislature an abstract of the accounts of the company, showing the whole amount of their capital actually paid into the funds of the company, and the amount of dividend declared in each year, or the losses sustained, as the case may be ; which abstract shall be verified by the oath or affirmation of the president of the company for the time being.

Section 12. And be it further enacted by the authority aforesaid, That the president, directors and company of the said rail road and coal company, shall have power to survey, lay down, ascertain, mark and fix such route as they shall deem expedient for a single or double track rail road, beginning at some point near Millersburg, Dauphin county, to some point on the Short Mountain, in said county, having due regard to the situation and nature of the ground, and of the buildings thereon, the public convenience and the interest of the stockholders, and so as to do the least damage to private property ; and the said road shall not be more than five rods wide ; and shall not pass through any burying ground, nor place of public worship, nor any dwelling-house, without the consent of the owner thereof ; nor shall it pass through any out buildings, of the value of three hundred dollars, without such consent : *Provided*, That the said rail road shall be made single or double, so as to accommodate the trade ascending as well as descending the same.

Section 13. And be it further enacted by the authority aforesaid, That it shall be lawful for the president, directors and company of the said rail

road and coal company, and their agents, and all persons employed by or under them, for the purpose contemplated by this act, to enter upon any land which they may deem necessary for laying out said road; and also for the purpose of searching for stone and gravel, or wood, for constructing said road; but no stone, gravel, sand or wood, shall be taken away from any seated land without the consent of the owner thereof, until the rate of compensation for the same be ascertained and paid; which rate of compensation, if the parties cannot agree thereon, shall be ascertained in the manner hereinafter prescribed, as to the compensation for lands over which said road may be laid.

Section 14. And be it further enacted by the authority aforesaid, That it shall and may be lawful for the company hereby incorporated, to make, erect, dig, excavate, and establish a single or double rail road as aforesaid; and said company are hereby empowered to make, erect and establish all works, edifices and devices to such rail road, as may by the said company be deemed expedient for the purpose of carrying into effect the objects of their incorporation; and also to contract and agree with the owner or owners for the purchase of any lands or tenements which may be necessary for the purpose of erecting the said rail road.

Section 15. And be it further enacted by the authority aforesaid, That whenever it shall be necessary for the president, directors and company of the said rail road company to enter in and upon and occupy for the purpose of making said rail road, any land upon which the same may be located, if the owner or owners of the said land shall refuse to permit such entry and occupation, and the parties cannot agree upon the compensation to be made for an injury or supposed injury that may be done to said land, by such entry and occupation, it shall and may be lawful for the parties to appoint five suitable and disinterested persons to estimate such damages, who shall be under oath or affirmation fairly and impartially to estimate the same, and shall reside within the proper county where the land lies; and the expenses incurred by the said appraisers shall be defrayed by the said coal and rail road company; but if the parties cannot agree upon such persons, or if the persons so chosen shall not decide upon the matter; or if the owner or owners of such land shall refuse or neglect to join in such appointment within twenty days after requisition for that purpose upon him, her or them made; or if such owner or owners shall be feme covert, under age, non compos mentis, out of the state or unknown, then it shall be lawful for the Court of Common Pleas of the county in which the land lies, on application of either party, and at the cost and charge of the said corporation, to appoint five disinterested persons, men of said county, to view, examine and survey the said lands, tenements or hereditaments, and estimate the injury or damage, if any, that in their apprehension will be sustained as aforesaid by reason of said coal and rail road, and report the same under their oaths or affirmations to the said court; which report being confirmed by the said court, judgment shall be entered thereon; and the viewers shall be entitled to like fees for their services as are allowed by law to reviewers of public roads and highways, to be paid by said company; and it shall be the duty of the said appraisers, in estimating such injury or damage, to take into consideration the advantages that will be derived to the owner or owners of the said lands from the said rail road: *Provided*, That either party may appeal to the court within thirty days

after such report may have been filed in the prothonotary's office of the proper county, in the same manner as appeals are allowed by the provisions of the arbitration act of one thousand eight hundred and ten ; and upon the coming in of such report and the confirmation thereof, or upon final judgment on appeal therefrom, and the said company paying to such owner the sum in such report or judgment specified, in full compensation for said lands, or for the injury sustained as aforesaid, the said company shall become seized of the same estate in the said lands which the owner held in the same ; and they and all who act under them shall be acquitted and free from all responsibility for and on account of such injury : *Provided*, That the payment of damages aforesaid for land through which the said road may be laid, shall be made before the said company, or any person under their direction, or in their employ, shall be authorised to enter upon and break ground in the premises, except for the purposes of surveying and laying out said road, unless the consent of the owner of such land be first obtained.

Section 16. And be it further enacted by the authority aforesaid, That the said rail road shall be so constructed by the said company as not to obstruct or impede the free use and passage of any public road or public roads which may cross or enter at the same, being now laid out or hereafter to be laid out ; and in all places where the said rail road may cross, or in any way interfere with any public road, it shall be the duty of the said company to make, or cause to be made, a good and sufficient causeway or causeways to enable all persons passing or travelling such public road to cross and pass over or under the said rail way ; which causeway or causeways shall be made and maintained by the said company ; and if the said company shall refuse or neglect to make such causeway or causeways, or when made to keep the same in good repair, they shall be liable to pay a penalty of ten dollars for every day the same shall be neglected or refused to be made or repaired ; to be recovered by the supervisor of the township, with costs, for the use of the township, as debts of like amount are by law recoverable, and shall moreover be liable to an action or actions at the suit of any person who may be aggrieved thereby ; and the service of process upon any officer or agent of said company shall be as good and available in law as if served upon the president thereof.

Section 17. And be it further enacted by the authority aforesaid, That for the accommodation of all persons owning or possessing land through which the said rail road may or shall pass, and to prevent inconveniences to such persons in crossing or passing the same, it shall be the duty of the said company when required, to make or cause to be made a good and sufficient causeway or causeways, wherever the same may be necessary, to enable the occupant or occupants of said lands to cross or pass over or under the same, with wagons, carts, and implements of husbandry as occasion may require : *Provided*, That the said company shall in no case be required to make or cause to be made more than one such causeway through each plantation or lot of land for the accommodation of any one person owning or possessing land through which the said rail road may or shall pass ; and when any public road shall cross said road, the person owning or possessing land through which the said road shall pass, shall not be entitled to make such requisition on said company ; and the causeway or causeways when so made shall be maintained and kept in repair by said

company ; and if said company shall refuse or neglect to make such causeway or causeways, or, when made to keep the same in good repair, the said company shall be liable to pay any person aggrieved thereby, all damages sustained by such person in consequence of such refusal or neglect, to be sued for and recovered before any magistrate, or any court having cognisance thereof ; and the service of process upon any officer or agent of said company, shall be as good and available in law as if served upon the president thereof.

Section 18. And be it further enacted by the authority aforesaid, That no suit or action shall be brought or prosecuted by any person or persons for penalties incurred under this act, unless said suit or action shall be commenced within six months next after the offence shall have been committed, or the cause of action shall have accrued ; and the defendant or defendants in such suit or actions may plead the general issue, and give this act and the special matter in evidence, and that the same was done in pursuance and by authority of this act.

Section 19. And be it further enacted by the authority aforesaid, That the company shall not prevent any person or persons from making such lateral rail roads, and to connect them with said rail road, as the said person or persons may conceive necessary for the purpose of transporting their coal or produce down or up the said road, they paying the usual tolls to the said company.

Section 20. And be it further enacted by the authority aforesaid, That on the completion of the said rail road, the same shall be esteemed a public highway, free for the transportation of all commodities ; and the said company may charge and receive tolls and for freights on and for the transportation of goods, wares and merchandisc, at the following rates ; that is to say : on each ton of coal, one and a half per cent. per mile ; on each ton of salt, gypsum and lime, one and a half per cent. per mile ; on brick, lumber, squared and round, per one hundred feet solid, two cents per mile ; on boards, plank, scantling, or other sawed stuff, reduced to inch stuff, one cent per one thousand feet per mile ; on shingles per thousand, one cent per mile ; on staves and heading for pipes and hogsheads, per mile, two cents per thousand ; and staves and heading for barrels and other vessels of less size, one cent per mile, per thousand ; on all other articles not enumerated, two cents per ton per mile ; on all single and detached articles weighing less than a ton, it shall be lawful to charge and receive on the transports thereof, an advance of twenty per centum on the rates as above established : *Provided*, That if at any time hereafter the tolls should not enable the company, after paying all repairs and other necessary expenses, to divide more than six per centum per annum on the capital stock expended, then and in such case the tolls may be increased by the said company, so that the dividend shall not exceed ten per centum per annum : *And provided also*, That whenever the aforesaid tolls shall exceed twelve per centum per annum, on the capital expended, they shall be reduced so as not to exceed that amount : *Provided also*, That every person or persons using the said road shall only use those carriages, and wagons, and conveyances which shall be adapted thereto ; which said carriages, wagons, and conveyances to be used thereon for the transportation of persons or commodities, shall be prescribed by the said company.

Section 21. And be it further enacted by the authority aforesaid, That

if any person or persons shall wilfully and knowingly break, injure, or destroy the rail road, or any part thereof, or any work, edifice, or device, or any part thereof, to be erected by the said company in pursuance of this act, he, she or they shall forfeit and pay to the said company, three times the actual damages so sustained, to be sued for and recovered, with costs of suit, in any court having cognisance thereof, by action of debt, in the name and for the use of the said company.

Section 22. And be it further enacted by the authority aforesaid, That if the president, managers and company shall not proceed to carry on said work within two years from passage of this act, and shall not complete the same as aforesaid, in seven years, according to the true intent and meaning of this act, or if after the completion of the said road, the said corporation shall suffer the same to go to decay and be impassable for the term of two years, then this charter shall become null and void, except so far as compels said company to make reparation for damages.

Section 23. And be it further enacted by the authority aforesaid, That if any increase of the capital stock be deemed necessary by the stockholders to complete the said rail road, it may be lawful for the said president, managers and company, at a stated or special meeting convened for the purpose, to increase the number of shares, so that the capital of said company shall not exceed forty thousand dollars, and to receive and demand the moneys for shares so subscribed in like manner and under like penalties as are hereinbefore provided for the original subscription, or as shall be provided for by their by-laws.

FRED'K SMITH,

Speaker of the House of Representatives.

WM. G. HAWKINS,

Speaker of the Senate.

Approved the seventh day of April, A. D. one thousand eight hundred and thirty.

GEO. WOLF.

STATE OF PENNSYLVANIA, ss.

Secretary's Office.

I do certify that the above and foregoing is a true copy of the original act entitled "An act to incorporate the Lykens Valley Rail Road Company, in Dauphin county," passed the seventh day of April, A. D. one thousand eight hundred and thirty, as the same remains on file amongst the records of this office.

[L. S.]

Witness my hand and seal of the office of Secretary of State, at Harrisburg, this second day of March, in the year of our Lord one thousand eight hundred and thirty-nine, and of the commonwealth the sixty-third.

FR. R. SHUNK,

Secretary Comm'lth.

SUPPLEMENTARY ACT.

A supplement to an act entitled "An act incorporating the Lykens Valley Rail-road Company in Dauphin county," passed on the seventh day of April eighteen hundred and thirty, and for other purposes.

SECTION I.—Be it enacted by the Senate and House of Representatives of the Commonwealth of Pennsylvania in General Assembly met, and it hereby enacted by the authority of the same, That the number of votes to which each stockholder owning two shares of stock in said company shall be entitled, shall be one vote for each share.

SECTION II.—And be it further enacted by the authority aforesaid, That the rates of tolls for the transportation on said rail-road, on coal, salt, gypsum and lime shall be one and one-half cents per mile for each ton thereof.

SECTION III.—And be it further enacted by the authority aforesaid, That the president, managers and company, at a stated and special meeting convened for the purpose, may increase the number of shares so that the capital of the said company shall not exceed sixty-five thousand dollars; and to demand and receive the moneys so subscribed in like manner and under like penalties as are provided for the original subscribers, or as shall be provided by their by-laws; and that the president of the said company for the time being shall procure certificates or evidences of stock for the shares of the said company, and shall deliver such certificates or evidences signed by him, and countersigned by the treasurer, and sealed with the common seal of said corporation, to each and every stockholder in one or more certificates for the number of shares held by such stockholder on application therefor.

Approved the thirtieth day of March, Anno Domini, eighteen hundred and thirty-three.

GEO. WOLF.

PENNSYLVANIA, ss.

Secretary's Office.

I, Francis R. Shunk, secretary of state in and for the commonwealth of Pennsylvania, do certify that the within and foregoing is a true copy of the first, second and third sections of a "Supplement to an act entitled 'An act incorporating the Lykens Valley Rail-road Company in Dauphin county,'" passed on the seventh day of April, eighteen hundred and thirty, and for other purposes, as remaining on file in the said office; being the only sections contained in said act having relation said company.

[L. s.]

IN TESTIMONY whereof I have hereunto set my hand and caused the seal of the said office to be affixed, at Harrisburg, this twenty-eighth day of February in the year of our Lord one thousand eight hundred and thirty-nine, and of the commonwealth the sixty-third.

FR. R. SHUNK, *Sec'y Com.*

FURTHER SUPPLEMENT.

A FURTHER SUPPLEMENT

To an act entitled "An act incorporating the Lykens Valley Rail-road Company in Dauphin county," passed on the seventh day of April in the year one thousand eight hundred and thirty.

Section 1. Be it enacted by the Senate and House of Representatives of the Commonwealth of Pennsylvania in General Assembly met, and it is hereby enacted by the authority of the same, That it shall be lawful for the stockholders of the Lykens Valley Rail-road and Coal Company, at any meeting summoned by the managers thereof, to authorise the president and managers to increase the capital stock of said company to any amount not exceeding in the whole the sum of four hundred thousand dollars, whereupon the said president and managers may increase the said capital stock accordingly, and sell and dispose of the new stock at their discretion, and issue certificates therefor in the usual form.

Section 2. It shall be lawful for the president and managers of the said company, from time to time and at all times, to borrow such sums of money and on such terms as they may deem expedient, for the use of said company, and to issue certificates of loan therefor, and to pledge and mortgage all or any part of the estates, tolls, rail-road improvements, privileges, effects, and assets, whatsoever of the said company for the repayment of said sums of money so borrowed, at such times as may be agreed on, and for the punctual payment of interest for the same.

WM. HOPKINS,

Speaker of the House of Representatives.

CHARLES B. PENROSE,

Speaker of the Senate.

Approved this thirteenth day of March, Anno Domini, eighteen hundred and thirty-nine.

DAVID R. PORTER.

PENNSYLVANIA, ss.

Secretary's Office.

I do certify that the above and foregoing act of the general assembly, entitled "A further supplement to an act entitled 'An act incorporating the Lykens Valley Rail-road Company in Dauphin county,'" passed on the seventh day of April in the year one thousand eight hundred and thirty; which was approved the thirteenth day of March, Anno Domini, one thousand eight hundred and thirty-nine, is a true copy of the original on file in this office.

[L. S.] IN TESTIMONY whereof I have hereunto set my hand and affixed the seal of the office of secretary of state, at Harrisburg, the thirteenth day of March, in the year of our Lord one thousand eight hundred and thirty-nine, and of the commonwealth the sixty-third.

H. PETRIKEN,

Deputy Secretary of the Comm'th.

REPORT OF THE DIRECTORS

OF THE

DEEP RIVER

MINING AND TRANSPORTATION

COMPANY.

ALBANY, MARCH, 1851.



ALBANY.

WEED, PARSONS AND COMPANY.

1851.

DIRECTORS.

JOHN TAYLOR,
EDWARD B. WESLY, } *Directors.*
H. B. HEWITT,

JOHN E. WILLIAMS, } *New-York.*
JOHN C. BEACH,

JOHN TAYLOR, *President.*

H. B. HEWITT, *Secretary.*

REPORT.

THE Directors of the DEEP RIVER MINING AND TRANSPORTATION COMPANY, in presenting to the Stockholders the very interesting and able report of Professor Johnson, feel it incumbent on them to enter into a detailed statement of the ECONOMICAL VALUE of their possessions; a subject which did not fall within the province of the learned Professor particularly to examine. THE VALUE OF A COAL MINE depends upon the *quality* of the coal; *its quantity, the cheapness with which it can be mined, and the facility and cost of transportation to market.* All these ingredients must combine to render a coal field valuable. The separate, independent existence of one or two of these, is not enough. If the coal is of *inferior quality*, or comparatively worthless, when brought into market, no one would think of expending capital upon it. If the *quantity* is insufficient, it would not be worth the undertaking. If the *expenses of mining* are too great, prudent men would not embark in such an enterprise; and if the cost of transportation to market is so great as to absorb all the profits, such an undertaking, if rashly engaged in, must of necessity, soon be abandoned. The questions then which occur are, what is the *quality* of the coal, what its *quantity*—at *what expense can it be mined and transported to market.* And first, as to its *quality.* The Report of Professor Johnson, than whom there is no higher authority, places the coal of Farmersville in *the first rank of bituminous coals.* “It has, says the Report, upwards of *eighty per cent of carbon*, and evaporates 8.10 of steam to one of coal,” which proves *its admirable adaption*

for steam purposes." It possesses the advantage of *brisk and brilliant combustion*, which renders it a most desirable fuel for *parlor grates*, and is an excellent coal for *smith's purposes*. It takes fire promptly, swells sufficiently, and agglutinates its masses together so as to form a hollow fire."

"The AMOUNT OF SULPHUR is *not such* as to prevent its usefulness in this application; or to interfere with its PRESERVATION EITHER ON SHIP BOARD OR ON shore."

The freedom from any considerable or dangerous amount of SULPHUR in this coal, always considered of the highest importance, has become doubly so, in view of the recent disasters which have occurred to one English and three American ships, which have taken fire and burnt in their attempts to reach the Pacific coast. The English ship was loaded with English coal; the American ships, with coal from the Cumberland mines.

Now when it is considered that the Richmond, the Pictou, and the Sydney coals, have always been supposed to contain large quantities of sulphur, so as to render the use of these coals dangerous on long voyages, it becomes apparent that such a coal as that at Farmersville, will be sought for as *the best of all others*, if it is not the only safe coal fit for long voyages.

As to its *quantity*. The coal bed is reported by the Professor, as being seven feet eight inches thick, with an interposing ply of slate eighteen inches, leaving six feet two inches of pure coal, and covering *an area, already discovered*, of about 300 acres. This bed of coal, as the Professor justly remarks, is equal in thickness to the *great Pittsburgh seam*; not inferior to *the main seam at New Castle*, and of the same thickness as the bed long worked at SYDNEY, CAPE BRETON. This ply of slate, on first penetrating the outcrop, was twenty-six inches thick, but gradually diminished when the Professor left, to eighteen inches. Since then the vein has been penetrated several feet further, in all eighteen feet, and the ply of slate has diminished to fourteen inches, *with every prospect of soon running out*; while the vein has increased to *nine feet in thickness*.

This Company then may count upon a bed of the best bituminous coal *three feet thicker* than the SYDNEY BED, or the

GREAT PITTSBURGH SEAM, or the main seam at NEW CASTLE; enough in *quantity* to *satisfy* the cupidity of most men. The questions of *quality* and *quantity*, we trust are answered to the entire satisfaction of every Stockholder.

The next question is as to the cost of mining, which has been stated not to exceed 45 cents; and when the ply of the slate has ceased, will be 15 cents less. This calculation of 45 cents is the extreme limit, as based upon a vein six feet two inches. A vein of nine feet can be mined at a less proportionate expense, than a vein of six feet.

But we will take the cost of mining at 45 cents per ton; add 15 cents for delivery into barges, and the cost of the coal on board of the barges is 60 cents.

The remaining question is, what will be the expense of transportation to Wilmington or Smithville, at the mouth of the Cape Fear river? We take the longest distance when we state the expense at 23 cents; and we have the entire cost of mining and transportation to Smithville at 83 cents.

Your Directors believe it can be done for 25 per cent less than this statement, but when they consider the rates at which other coals are mined, and transported to tide water, they are prepared to encounter a great deal of public incredulity on this point. (See note A in appendix.) They therefore subjoin a statement which they think *includes every item of expense*, with a liberal allowance for contingencies, and to which they invite the *severest scrutiny* of *practical* men. The estimate has been submitted to the examinations of persons conversant with the statistics of transportation, and in every instance, the highest estimate of any one individual has been taken. The striking disparity in the cost of transportation to market of your coals, and any other with which they may come in competition, arises from *the superiority of your communication with tide water* in two respects: first, the *cost of the respective improvements*; secondly, their *capacity*.

The cost of the Lehigh Navigation, was,	-----	\$4,555,000
“ “ “ Schuylkill, “ “	-----	5,785,000
“ “ “ Reading & Pottsville Rail Road,		11,590,000
“ “ “ Ohio & Chesapeake Canal,	-----	17,000,000

While the entire cost of the Cape Fear and Deep

River Improvements, did not amount to ---- 400,000

Again :—The canals in which the above coals are carried to market, vary from three to six feet of water in depth, with a width not exceeding 60 feet. DEEP RIVER (so appropriately called,) is from 10 to 15 feet deep in its pools, and will average 450 feet in width. The number of locks on many of the Pennsylvania canals, is more than one to a mile. On the Chesapeake and Ohio canal, there are 78 between Cumberland and Alexandria ; on the Deep and Cape Fear rivers but 18. On the Deep and Cape Fear Rivers, STEAM POWER will be used to draw the coal barges ; on the other canal improvements, animal power must be used ; and the difference between the expense of the one and the other, is as great as is the difference between the strength of the puny mule, and the giant engine.

When your coal arrives at Smithville, it can be transported to New-York for \$1.75 per ton, which added to 83 cents cost at Smithville, makes it cost at New-York \$2.58 per ton. The selling price of bituminous coal at New-York is usually from \$6 to \$7 per ton. Should the market at New-York ever become glutted with bituminous coal, this company can undersell all others, and yet make enormous profits. But the best markets for your coal will be at SMITHVILLE ; this place is situated at the outlet of Cape Fear river, directly upon the ocean, but protected by Smith's Island, so as to form a secure harbor. Vessels can enter this harbor drawing 18 feet of water ; it is directly in the track of the steamers that ply from New-York to Charleston, Savannah, New-Orleans, Texas, the West Indies, Mexico and Chagres. By taking on board a sufficient quantity of coal at New-York to bring them to Smithville, vessels might complete their cargoes there at a great saving of expense. The coal would readily sell at Smithville at \$4 per ton, yielding to the company a profit of at least \$3. No other company can compete with your company in southern markets, *situated as you will be*, within a days sail of Charleston, and within three of the island of Cuba.

ANTHRACITE COAL.

In addition to the above *Coal Field*, your company own two several tracts of land adjoining each other, and amounting to eleven hundred acres, underlaid with *Anthracite* coal,

which compares favorably to the best anthracite coals of Pennsylvania. There are two beds of this coal, one of which *overlays the other*, and gives additional thickness and greater amount to this coal-field.

Though the mining of this anthracite coal cannot be rendered as profitable as the bituminous, yet it can be mined and transported to Boston and the ports east of that city, at a greater profit than any of the Pennsylvania anthracites.

The cost of mining and transporting a ton of bituminous coal from Farmersville to Smithville, as we have shown, is only 83 cents. If we add 15 cents as the greater expense of mining anthracite coal, we have our anthracite at Smithville at 98 cents : add transportation to Boston, 2 dollars, and we have \$2.98 as the entire cost of the coal in Boston.

Take the costs of the anthracites at tide water, as heretofore stated :

<i>Pequa Company</i> , at Havre-de-Grace, -----	\$2 05	
Add transportation to Boston, -----	1 75	
	-----	\$3 80
Cost of Deep river anthracites, -----	2 98	

Difference in favor of Deep river coal, -----		\$0 82
<i>Lehigh Company</i> , cost at tide-water, -----	\$2 55	
Add transportation to Boston, -----	1 50	
	-----	\$4 05
Cost of Deep river anthracite, -----	2 98	

Difference in favor of Deep river coal, -----		\$1 07
<i>Delaware and Hudson</i> , cost at tide-water, --	\$2 56	
Add transportation to Boston, -----	1 50	
	-----	\$4 06
Cost of Deep river anthracites, -----	2 98	

Difference in favor of Deep river coal, -----		\$1 08
<i>Pottsville District</i> , cost at tide-water, -----	\$2 85	
Add transportation to Boston, -----	1 50	
	-----	\$4 35
Cost of Deep river anthracite, -----	2 98	

Difference in favor of Deep river coal, -----		\$1 37

Your Directors believe they can engross the markets at Boston and east of that place, with greater profits than any company who have heretofore sent anthracite coal in that direction.

In estimating the great advantages of YOUR LOCALITY, one other consideration deserves to be particularly mentioned, as it is entitled to great weight and consideration; which is the *uninterrupted communication* you would have, *during the whole year*, through the waters of Deep and Cape Fear rivers, and which are never impeded by ice. While the canals of Maryland and Pennsylvania are *frozen up*, you would find your best markets *at the South*. This circumstance alone would give a greatly increased value to your possessions, if they needed any further recommendation.

THE SITUATION OF YOUR COALFIELD, directly upon Deep river, which, by the accompanying map, No. 4, attached to the report of Prof. Johnson, is shown to wash two sides of it, will exempt you from the necessity of building expensive railroads to transport your coal to your barges, an expense which has subjected the mine owners at Sydney, Pictou, Richmond and Maryland, to enormous outlays. In estimating the cost at which their coals can be transported to market, the interest on those outlays is not always reckoned as it should be, and added to the cost of coal at market.

A PORTION OF THE PROPERTY OF THIS COMPANY consists of $987\frac{1}{2}$ acres of land at Farmersville, embracing your bituminous coalfield; one-half of this is under cultivation, and the residue is well wooded with yellow pine and oak. Timber is abundant in this vicinity, and land covered with a heavy growth of pine, oak, &c., can be purchased adjacent to the borders of Deep river, (without the coal district,) at less than two dollars the acre. This is a circumstance of some importance, in view of the expense of building steamers and barges.

Provisions are abundant and cheap. Beef, of an excellent quality, can be purchased at \$2.50 per one hundred pounds; mutton at $37\frac{1}{2}$ cents per quarter; fowls at one dollar per dozen; meal 40 cents per bushel; potatoes 30 cents, and other articles of food in like proportion.

THE CLIMATE IS PERFECTLY HEALTHY, as much so as any part of New England. The water at Farmersville, and at most places on Deep River, is excellent. Your location

abounds in springs of the purest water. Indeed, the county of Chatham is the resort of many people from the lower part of the State, during the prevalence of the sickly season in that quarter.

Your Company have bought a depot in the city of Wilmington, embracing part of the northern portion of that town, but extending to both sides of the river, with a front of twelve hundred and fifty feet on each side of the river. On the Wilmington side we have a wharf six hundred and twenty-five feet in length.

We have contracted for another site for a depot, at Smithville, which has been termed the NAHANT of North Carolina, and is as pleasant and salubrious, as that celebrated watering place near Boston.

The improvements of the river will be completed by the first day of January next. Responsible contractors are under heavy bonds to finish the work by that time.

Your Directors have engaged a skilful mining engineer, who will proceed to Farmersville early in April, with a number of miners, carpenters and other mechanics, to commence operations immediately, so as to be in readiness to ship your coal to market as soon as the way to the ocean is opened to them.

It is the opinion of Professor Johnson, and also of Joseph P. Silver, Esq., of Philadelphia, a gentleman scientifically and practically acquainted with the various kinds of coal, that the coal of Farmersville will not disintegrate, or fall into fine coal upon being exposed to the air, which quality will warrant the mining in advance of the opening of the navigation. The above quality of great adhesiveness of its particles, gives it a great value over most other bituminous coals.

Contracts will be made for building steam tugs and barges, in season for the transportation of the coal. A person perfectly responsible, has offered to build the barges at our estimate.

In conclusion, your Directors congratulate the Stockholders upon the possession of coal fields, which, when the quality of the mineral and its *admirable locality* are duly considered, they deem *more valuable* than any other with which they are acquainted.

JAN 16 1948

APPENDIX.

(A.)

Estimate of the expense of mining and transporting one ton of coal from the Farmersville mines on Deep river, to Wilmington or Smithville — distance from Farmersville to Wilmington, 170 miles ; to Smithville 200 miles.

10 barges, at \$600 is,-----	\$6,000 00
1 steam tug 100 horse power, -----	8,000 00
	<hr/> \$14,000 00
Wear and depreciation, and interest on steam tug and barges at 20 per cent per annum,---	2,800 00
20 men on ten barges, at \$15 per month,-----	3,600 00
Captain of steam tug, at \$50 per month, -----	600 00
Cheif Engineer on tug, at \$75 per month, -----	900 00
Assistant engineer per year, -----	600 00
Pilot for steam tug per year, -----	360 00
Cook for one year, -----	180 00
4 common hands on steam tug, at \$15 per month, -----	720 00
Board of 29 men at \$6 per month for one year,--	2,088 00
Oil, tow lines, &c., for one year,-----	365 00
20 tuns coal for each trip from the mines to Smithville, and back as fuel for tug steamer, at \$1 per ton, allowing 3 trips in each month, is \$60 per month, or \$720 per year, -----	720 00
10 barges of 120 tons each, will carry 1,200 tons each trip, or 3,600 tons per month, or 43,200 tons per year—tolls to be paid to the river improvement at 43,200 tons at 8c., -----	3,456 00
Mining and stacking on the bank of the river, or putting on barges, 45c. per ton on 43,200 tons, is	19,440 00
	<hr/> <hr/> \$35,829 00

Total expense of mining and transporting 43,200 tons to tide water. Allowing the above estimate to be correct (which includes all reasonable expenditures) the cost of mining and delivering of one gross ton at tide water :—Wilmington or Smithville, is $82\frac{23}{100}$ cents.

A steam tug of 100 horse power, will tow 10 barges of 120 tons burden, at the rate of 4 miles an hour, exclusive of the time required in passing locks, which is 50 hours for 200 miles, as will be seen by the following estimate.

It will require 10 minutes for each boat to pass each lock. 11 boats would use 110 minutes at each lock. 16 locks would occupy 30 hours as stated here, makes 80 hours. According to this estimate, it will require to go from the mines to Smithville, 3 days and eight hours.

Going from and returning to the mines,	6 days 16 hours.
Loading barges, 24 hours or one day, --	1 day.
Unloading barges, -----	1 day.

One trip will require -----	8 days 16 hours.
-----------------------------	------------------

Three trips will require 26 days, or deducting Sundays, 29 days.

(B.)

The following estimate of the *cost of Anthracite at different shipping ports at tide-water*, is taken from the report of the Directors of the Pequa Railroad Improvement Company and is presumed to be correct:—

PEQUA COMPANY.

Cost of mining and delivering at Dauphin,-----	\$1 10
Freight and toll to Havre-de-Grace,-----	95
Cost at tide-water, -----	\$2 05

LEHIGH COMPANY.

Cost of mining and delivering at Mauch Chunk, --	\$1 10
Freight and toll to Bristol,-----	1 45
Cost at tide-water, -----	\$2 55

DELAWARE AND HUDSON COMPANY.

Cost of mining and delivering at Hondesdale,----	\$1 16½
Freight and toll to Rondout,-----	1 40
	<hr/>
Cost at tide-water, -----	\$2 56½

POTTSVILLE DISTRICT.

Cost of mining and delivering at Mount Carbon,---	\$1 20
Freight and toll to Richmond and Philadelphia,---	1 65
	<hr/>
Cost at tide-water,-----	\$2 85

It will be borne in mind that the above coals are all anthracites, and are not worth so much in New-York markets as the bituminous coal, by about \$2 per ton.

The cost of mining and transporting the Maryland coal to Alexandria at tide-water, is-----	\$3 00
Against 83 cents for the Deep river coal,-----	83
	<hr/>
Making a difference in favor of Deep river coal, ---	\$2 17

This is the coal with which ours will come in competition in the New-York markets. Our coal is now in that city, and we invite a comparison of it with any other bituminous coal.

(C.)

The Nonentum, a Boston ship, loaded at Baltimore with *Maryland* coal.

The Symetry, 1,000 tons burden, with 1,200 tons coal, also loaded at Baltimore with Maryland coal.

The Humayon, a *Scotch ship*, from Dundee.

See the letter of Mrs. BATES, published in the New-York Daily Tribune, March 50, 1851.

A few years since, an English Steamer in the Mediterranean sea, took fire from the spontaneous combustion of her coal, and was entirely consumed.

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